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EDITORIAL NOTES—GAS, &c.

Eastern Counties Association Meeting at Tottenham—Further Views on Verticals.

OBSERVATION, especially "observation with extensive view," is a valuable educator; and this we think will be endorsed by those members of the Eastern Counties Gas Managers' Association who, on Wednesday last, visited Tottenham, where they had plenty of great technical importance to them upon which to exercise the above-mentioned faculty. Technical papers and discussions are one, and excellent, means of conveying information and instruction; but they are not always the best. And there is not a single member of the Association privileged last Wednesday to visit the works of the Tottenham and Edmonton Gas Company and the extensive meter works of Messrs. Thomas Glover and Co., Limited, who will say that the diversified and modern engineering and manufacturing work that passed under their observation could have been better comprehended by them through any descriptive essay. Readers of the "JOURNAL" have been kept informed as to the large works' reorganization and extension scheme that, forced by a remarkable development in business in recent years, has been carried out by the Engineer (Mr. A. E. Broadberry); and it is the result of the planning and the years of execution that the visitors on Wednesday penetrated with avidity and enjoyment. There was one regret. It was that an engagement in London prevented Mr. Corbet Woodall, the Chairman of the Company, from being present during the day; but Mr. D. Ford Goddard, M.P. (Mr. Woodall's deputy in the chair), was a courteous and efficient representative—efficient because his professional occupation twenty years since was that of his visitors; and what is more, he practised that profession in the capital town of one of the Eastern Counties—Ipswich. On this ground, he can in truth claim to be an Expert Gas Director.

We have not space to spare on this occasion to again discuss at length the matter of the expert Director. But as it—and very appropriately under the circumstances—furnished a peg for a couple of speeches at the luncheon at which the hosts of the day, with great generosity, entertained their visitors, it may be incidentally alluded to for the benefit of those who are of a contrary mind to the originator of the controversy over the subject. In the administration of the Tottenham Company, there are two gas expert Directors; and two of specialized qualification are quite sufficient on one Board of limited size. Without the experience possessed by Mr. Woodall and Mr. Goddard, it is quite likely that, notwithstanding the clamouring for gas in Tottenham and the surrounding district, a Board composed entirely of laymen would have stared aghast at Mr. Broadberry, as he came along time after time, and coolly asked for the thousands of pounds that he has expended, and expended profitably, on the works (as is seen by the increasingly economical operation). They would probably have urged him to be content with some patchwork scheme that would not have been to the advantage of the future of the Company nor of the gas supply to the large and prolific district. The situation at Tottenham called for drastic measures, for men who could appreciate the requirement, and men who, apprecia ing, were strong enough to meet it. During those years, Mr. Broadberry would not, given the choice, have been without his expert Directors; and it is Mr. Goddard who, with his own knowledge as formerly a Gas Manager and Engineer and now as a Director, says: "There should "be on the Boards of Gas Companies those who know from "personal experience something of the difficulties of their "officials." That is true; and the presence of an expert gas engineer on a Board—if he is a man as well as a gas expert—gives a sense of security to the Engineer, to the remaining Directors, and to the proprietors generally. The remarks made at Wednesday's luncheon on this head are well worth reading. We hope those who have publicly given expression to views of a contrary nature will never have the misfortune of being reminded of them if ever they are candidates for seats at a Gas Company's Board.

Forming a kind of interlude in the round of inspection on Wednesday was a business meeting of the members of the Association, at which Mr. R. G. Shadbolt resigned the presidential chair to Mr. E. J. Brockway, of Cleethorpes. It is not often that an Association get a succession of Presidents who have individualized themselves by directing their energies along special lines as have, and meritoriously, Mr. Shadbolt and Mr. Brockway. The latter gentleman having given sanctuary to the Settle-Padfield retort system at Cleethorpes, and having made trials which disclosed certain deficiencies in method, naturally gave to the system a considerable prominence in his Inaugural Address. His pronouncement will undoubtedly give a very rude shock to the system, which has already suffered severely by a not too generous assistance in its inchoative stage, and by being sent out to take its place, while yet in something of a hobbledehoy condition, in competition with the older carbonizing systems and vertical systems that have had more favourable developing opportunities. But now Mr. Brockway, through his first disappointment, appears to have jumped from one extreme to the other—without stopping to inquire whether there is not some half-way road out of the difficulties in working. He does not give us anything of a categorical nature to show that his rapid transit from one mode of operation to its antithesis was justified either by experience or by reasoning based on the experience; or, to put the position in another way, he seems to have missed the full importance of the lessons that lie between the two extremes. All we find is that Mr. Brockway came to the conclusion that it was not practicable to fully carbonize the coal when charged into the retorts (as he disparagingly describes it) "in pinches," and that filling the retort in one operation was, in his opinion, preferable. Without prejudice to what we have to say presently, it may be conceded that it is probable as the structure stands, the preference was correct. It is, however, seen that the principal difficulty was in connection with the plunger method of feeding, by the jamming of the plungers and the formation of lampblack in the foul main. But there is no evidence to show that any effort was made to see whether the particular plunger employed exhausted engineering ingenuity; and, as to the lampblack, the President himself points out that "the remedy for this was found in keeping "the retorts always partially filled." This is the stage from which, had the trial-work that started at Exeter, the results of which (recognized by engineers as being purely experimental) were published in the technical press and by Professor Vivian B. Lewes, been allowed continued prosecution, the Settle-Padfield system might eventually have made a radical departure—not from admitting the charges in almost continuous small doses, but from what the trials at Cleethorpes indicate is the error of continuous charging with intermittent withdrawal. The process was to empty the retort down to the sloping portion, and then to resume gradual charging until the retort was again nearly full; the result being that, during a large part of the period of early carbonization, the vacant space in the retort was out of all proportion to the charge. That is a consideration of the utmost importance.

Mr. J. H. Brearley suggested, in seconding the vote of thanks to the President for his address, that it had rung the death knell of continuous charging. It has, in our opinion, done nothing of the kind. If anything, it has rung the death knell of continuous charging when combined with intermittent drawing. Mr. Brockway himself inferentially condemns continuous charging, and declares his preference for bulk charging. But his view might have been different if the construction of his bed of retorts had permitted of a

trial being made of continuous withdrawal, so as to have maintained a fairly uniform, but limited, free space above the charge, and not a widely fluctuating one. The Bournemouth investigators have pinned their faith to continuous charging and discharging; and the main trend of fresh invention in connection with the use of vertical retorts is towards that consummation. If there is continuous charging, it seems clear there must be continuous, or almost continuous, discharging. We cannot emphasize too much by repetition these significant sentences in the address:

> **Our principal difficulty in connection with the plunger method of feeding was the jamming of the plungers, and the formation of lampblack in the foul main, *which always took place after emptying the retorts*; the remedy for which we found to be in keeping the retorts *always partially filled*—lamp black only forming when small portions of coal were put into the empty retorts.**

And so on. What caused these difficulties, and the similar ones in the settings at Rotterdam and the Tegel works of the Berlin Municipality? Intimation as to both cause and remedy are made by Mr. Brockway in the above quotation. The cause was unquestionably the over-exposure of the hydrocarbons in an excessive free space. Of course, even in a limited free space obtained by keeping the retort partially filled, should there be over-heating of that space, the same results might ensue; but there is no occasion to overheat in a restricted space at the top of a vertical retort. On these points, the paper read by Mr. Thomas Glover at the last meeting of the Institution of Gas Engineers is instructive; and in that paper it is seen that Mr. William Young and Mr. Samuel Glover in their form of vertical retort are arranging for filtering out the lampblack (should any be formed) by the incoming coal, and so prevent accumulations of that substance and of pitch in the hydraulic main. But the great thing appears to be to so adjust the temperature of the free space, if there is a free space, as to obviate the production of lampblack. It is between the two extremes of the Cleethorpes experience that, in our opinion, the most valuable lessons are to be learnt; and therefore hearty welcome is given to that experience as contributing to the solution of the interesting problems now before the industry. One thing the President was very emphatic upon, and it is that the curved end of the Settle-Padfield retort is a mistake. But, notwithstanding his discouraging experience, he is still hopeful of the ultimate success of the vertical retort.

In other parts of the address, the President exhibits a strengthened faith in the combination of Dellwik blue water gas and coal gas; he gives another encouraging push to the application of tar to road purposes; and he bears testimony to the usefulness of Commercial Sections in connection with District Associations. Though not an extensive address, it is, within its limits, filled with statements that will claim attention in all quarters—both near and distant—of the gas-making industry.

The Report of the Nottingham Investigation Committee—Charges Not Proved.

The Special Committee appointed in June by the Nottingham City Council "to investigate, and report upon, the "present position and working of the gas undertaking of "the city, and on any improvements or alterations, neces-"sary to be made therein, &c.," issued their report last week; and it came before the Council yesterday, as will be seen by the special account of the proceedings in our "Miscel-"laneous News" to-day. The gas industry has awaited this report with a threefold interest: Firstly, because the reputation of a Gas Engineer who has shown in his professional work keen ability and a robust character was at stake; secondly, because it was expected of the Committee that they would show their strength by a complete exposure of the right or the wrong of the attack made upon Mr. Brown; and, thirdly, there was curiosity to learn the line of policy that the Committee would advocate for the future conduct of the gas undertaking. The verdict, we have no hesitation in saying, will be universal, that the report on its personal side is dismally weak; the report in respect of its administrative plans for the future is, to put it mildly, extraordinary, and the recommendations, if established, will be found totally unworkable. It is, so far as its main parts go, in all but a single line, a most disappointing report. The important personal questions involved in the inquiry are dismissed in the words: "The charges made against the Gas "Engineer have not been proved." The studied economy of this statement, and its poverty of spirit, encourage a suspicion that the Committee have tried to spare certain persons the unpleasantness of a declaration reflecting, in stronger light, the hollowness of accusing speeches in the Council Chamber and the pettiness of actions. We do not know whether anyone concerned in this matter is interested in the coming November elections; but, if so, perhaps an explanation of the moderation of the Committee may be looked for in that direction.

However, not being in any way bound by local influences or prejudices, the report can be treated here with perfect independence; and, in the first place, we appeal strongly, in the name of Justice, to members of the Nottingham Corporation favourable to such a course not to leave a stone unturned to secure the publication of the proceedings before the Special Committee. It may be that they have been advised that the publication of the evidence would be illegal without the consent of both parties to the inquiry. If this be so, it will be the business of the ratepayers to inquire which of the parties it is who withhold consent; and judgment must follow accordingly. We may here be wrong, but we cannot at present believe—the inquiry being a command of the City Council, and the subject-matter of the inquiry the concern of the ratepayers—that the publication of the evidence would be illegal. On the contrary, we feel inclined—until the point of law is placed beyond question—to regard abstention from publication as nothing better than an act in the interests of local politics. The appeal for publicity is made here on the ground that it is altogether insufficient, when a man's professional honour and reputation have been impugned (for incompetency and neglect were the essence of the charges) in the dogmatic and persistent fashion that they were by the late Chairman of the Gas Committee (Mr. E. Harlow), to say that "the charges "made against the Gas Engineer have not been proved." If the charges are not proved, then the Gas Engineer is not guilty in respect of the accusations made against him by Mr. Harlow, who had not strength enough to carry a majority of his Committee with him. If Mr. Brown is not guilty, then what other construction can be put upon the words of the Special Committee than that Mr. Harlow was not justified in either his attitude or charges, or in pressing for the resignation of the Engineer; and we now say, and say deliberately, that until the nature of the ground for that attitude is completely disclosed, full justice will not have been done to the Gas Engineer—notwithstanding that Mr. Harlow now says he is satisfied with the decision of the Committee. Another reason for asking for the publication of the report is that Mr. Harlow had his say, and to the full, in open Council; but the same publicity has not been—as it ought certainly to be—accorded to Mr. Brown. It is the paid official against a councillor unshackled by official position, with its obligations and ties. Herein is a matter of the gravest importance to all engaged in municipal official life; for at any time the same thing may happen to others. The result of the inquiry also shows the danger that lies in any decisive action being taken on the bare assertion of any single individual. On all grounds, it is clear that nothing but the publication of the proceedings at the inquiry can give complete satisfaction, and the vindication that is clearly Mr. Brown's due. *Fiat justitia, ruat cœlum.* But the heavens will not in this case, in view of the finding of the Committee, be represented by the Gas Engineer.

While the chief finding of the Committee is inadequately stated by them, the principal of the recommendations as to future policy are, as we have said, extraordinary. The Committee declare that it is desirable for one official to undertake the entire management of the undertaking; and they submit a scheme for the reorganization of the administration. It is suggested that an engineer having practical experience in gas manufacture, and a thorough knowledge of mechanical engineering, should be appointed to take charge of the whole of the manufacturing stations and the plant used therein, and that he should be responsible for the manufacture of gas and for the carbonizing results up to a point where the gas is delivered into the charge of the distribution department. The Committee further advise the appointment of a manager to undertake a variety of duties which will require him to be a man of more parts than any other manager, who is not also the engineer, in the gas industry. He is to be a commercial man, a gas chemist, a distributing engineer, and a gas-works constructor. The "manager" must possess

all these qualifications, because the Committee recommend that he shall superintend "the commercial portion of the "undertaking, the chemical industry arising out of the "manufacture of residuals, the entire distribution depart-"ment, and the advising as to the installation of new plant." It is altogether an ill-fitting scheme for a gas undertaking if smooth working is desired. In the first place, it is clear that the Engineer is not to be subservient to the Manager, seeing that, while he is to work in harmony with him, he is to have independent access to the Gas Committee. If this recommendation is adopted, there is in it the making of a pretty mess of the future administration of the Nottingham Gas Department. There would be one constant struggle for supremacy in authority; and endless would be the friction, unless officials of angelic temperament could be found. In the second place, it is an utterly preposterous suggestion that there should be such overlapping of duties that the Manager should have the advising as to the installation of new plant, and not the Engineer who is responsible for the manufacture, the stations, and the plant therein. The recommendations, in short, propose the creation of a unique and untried system of management as applied to a gas undertaking. It is not what Sir George Livesey contemplated in his 1903 report, which was modified by the further report of May last. True the latter report did not refer to the division of commercial management and engineering; but there are words in it which have a bearing:

> I think [wrote Sir George only last May] looking back, it would have been better had some gas engineer of long experience in large works been available for reference and occasional consultation. I am not prepared to say that this is necessary now. Mr. Brown of to-day is not the same Mr. Brown that you appointed in 1902. He has had large, valuable, and extensive experience in the best of all schools—that of great difficulties and anxieties, and that, too, in connection with your own large works. *He now knows probably more about the supply of gas in Nottingham than any other man in the profession; and it is therefore very doubtful whether change is necessary.*

What Sir George was advocating in 1903 was a clear division between the, on the one hand, commercial and, on the other, engineering, manufacturing, and distributing work—nothing more. And it is not the Sheffield or any other existing plan of divided responsibility in the management of a gas concern that is now advocated by the Special Committee; but we submit, with all respect to the members, that it is a crude and clumsy division of responsibility that they are proposing—no doubt with excellent intention, but deficient knowledge. Moreover, the cities and towns of any importance where there is divided responsibility can be counted on the fingers of one hand; in all other undertakings, the engineering and general management are under one supreme head, with, as a rule, qualified engineers at each works, responsible to the chief. There is something here for the Nottingham Corporation to think about as an alternative to the scheme of the Special Committee. And be it remembered in this connection that Mr. Brown "now "knows probably more about the supply of gas in Notting-"ham than any other man in the profession."

There are other recommendations by the Special Committee, comprising (*inter alia*) delay in acting upon the report until the appointment of the new Gas Committee in November; and then that Committee, it is suggested, should "in "addition to their ordinary duties, inquire into the present "condition and working of the gas undertaking, and the "way in which it is proposed to give effect to the recom-"mendations contained in this report, reporting to the "Council thereon." In this way, the Special Committee are relieved of further responsibility; and this also no doubt accounts for the absence of any suggestion in the report as to Mr. Brown's future position. The recommendation, however, gives all concerned a little respite before further action is taken on the proposals of the Special Committee. This is a good thing, because we cannot think that any Gas Committee, on mature consideration, would venture to become responsible for the administration of an undertaking working under such a singular, ill-conceived scheme of official management as is now contemplated. The Special Committee have, of course, great faith in their suggestions, and believe they ought to be carried out. But it is a satisfaction to learn from Sir John Turney's speech yesterday that there is no desire to force them upon the new Committee—in other words, they can reject or accept as they pleased. Rejection should undoubtedly be their fate.

Convenient Ignorance.

ALTHOUGH it is playing a double part, and perhaps cannot be absolutely defended from the ethical standpoint, it is sometimes found convenient to affect ignorance. We are not going to accuse Mr. Faraday Proctor, the Electrical Engineer of Bristol, of affecting ignorance on a most particular point at an inquiry into an application for a loan for the Corporation Electricity Department; but, if he was not, then clearly he owned up to a deficiency of knowledge that it might be expected every responsible borough electrical engineer would possess. A question was put by the Inspector, as to the relative cost of gas and electricity for the lighting of the streets. Mr. Proctor's reported reply is: "He was not up "in the subject; and he would rather not discuss it. He "was not prepared to state the relative cost." And this is the Electrical Engineer of the City of Bristol! But that is not all. The Inspector asked for some information as to the arc lamps. This, too, not being forthcoming, his comment was that this did not redound to the credit of the undertaking. To Alderman Pearson it also came "as a surprise" that they should be expected to know "the whole of the "doings" of the Gas Company, as compared with their own undertaking. Not the "whole," Mr. Alderman; but merely the simple commercial question as to what a competitor is either charging for certain work, or is prepared to charge, in comparison with one's own charges. Municipal officials and members of corporate bodies are appointed to look after the interests of the community. But at Bristol the pernicious system apparently prevails of caring little whether or not the Corporation can do a certain thing cheaper or more efficiently than a competitor; and, in the interests of municipal trading, economic administration is ignominiously brushed on one side. But the ignorance—assumed or otherwise—of the Electrical Engineer and Alderman Pearson was not shared by some of the ratepayers present, one of whom showed that the Gas Company were prepared to supply high-pressure gas-lamps, giving a superior illumination to that of the arc lamps, at less than half the cost. Upon which Alderman Pearson got flitting about in the great brilliance of high candle powers, until he was reminded that there was a difference between sufficiency and waste; and the Inspector inquired whether light was wanted 19 feet in the air or on the pathway. From the sublime to the practical was evidently too much for the Alderman, for no reply is reported. Owing to the use of electricity instead of gas in the streets of Bristol, it is asserted that there is a loss of about £6000 a year. Is this the product of ignorance? We cannot bring ourselves to think so, but rather believe that the interests of the electricity undertaking have greater claim upon a majority of the Corporation than the interests of the ratepayers; for reminder was made at the inquiry that, when in 1901 a proposal to improve the street lighting by incandescent burners was made, it was "defeated by the members of the Elec-"tricity Committee who were on the Lighting Sub-Com-"mittee of the Sanitary Committee." Wheels within wheels. It is getting clearer and clearer every day that a very distinct line ought to be drawn by the Legislature between the legitimate administrative work of a Corporation and its trading departments, so that they can be conducted with complete independence. As it is, ratepayers and private enterprise are everywhere suffering, in more or less palpable ways, from the abnormity of commerce being conducted on uncommercial principles.

The Difficulties of Disposing of Spent Ammonia Liquor.

Gas managers and engineers vexed over the question of disposing of their spent ammoniacal liquor, and halting between the alternatives of stopping the working of their sulphate of ammonia plant and facing an application against their companies for an injunction to restrain them from producing ineffectiveness of the bacteria beds at the sewage works, will read with interest the article by Mr. John Radcliffe, of East Barnet, which we print in the current issue of the "JOURNAL." The question of disposing of such liquor is becoming a more serious one day by day, with the growth of the production of sulphate of ammonia, not only in the gas industry, but in other directions—such as coke-ovens and blast-furnaces—and the seriousness has become concurrently accentuated through the extension of the application of the more modern and scientific methods of treating sewage. On various occasions attention has been drawn, by

references to application and experience, to the fact that Mr. Radcliffe is the inventor of a simple and inexpensive plant for the purification of spent liquor to a degree which makes permissible its entry into the sewers up to a considerable percentage without affecting the bacteria beds; indeed, up to a certain point, the evidence suggests that effluent purified by his process encourages the bacteria growth. Mr. Radcliffe's plant, though inexpensive and simple, has a very comprehensive action upon the spent liquor; observations of samples showing that the system results in the continuous and automatic removal of free lime, tar particles, organic ammonia, sulphocyanides, cyanides, ferrocyanides, and sulphides, as well as compounds of dithiocyanogen. From the results of research and practical experience sketched in the article, the conclusion may be drawn that, of the effluent purified by the process, an addition of 25 per cent. can be made to the volume of sewage without injuring the efficiency of subsequent treatment; whereas it was found that 3 per cent. addition of the original liquor was sufficient to absolutely prevent the development of the bacteria required to purify the sewage. It was noticed last week that the Waltham Abbey Gas Company had adopted the plant, on the advice of their Engineer, Mr. W. B. Randall; and allusion has previously been made to what has been done at Sutton. The experience at Sutton has been unique, inasmuch as the first bacteria beds for the treatment of sewage (the system with which Mr. Dibdin's name is identified as the originator) were put down at that town; and it was the Sutton Gas Company who—meeting in an enterprising spirit the difficulty that was caused at the bacteria beds on the manufacture of sulphate of ammonia being entered upon—proved the efficiency of Mr. Radcliffe's process. Great credit is due to Mr. George Mead Robbins, the Engineer and Secretary, for the interest he has taken in the establishment of the process, as well as to the Manager, Mr. S. Carpenter.

Coke and the Cement Trade.

Coke has recently been commanding better prices among cement manufacturers; and there is good reason to hope that in this direction values will for a good period be maintained. Up to about last March, the cement market was somewhat dull, and competition was then doing its work in making the position as uncomfortable as possible for the makers. But while the other day Mr. F. A. White, the Chairman of the Portland Cement Manufacturers, Limited, was in one breath speaking dolefully of trying times, in another he was telling of £211,642 having been spent in the past two years in additions to plant and buildings and in developing and perfecting new plant. That is an encouraging sign. Then, again, last April manufacturers began to put up the price of cement. Mr. White now reports that "there has been justification for the rise in price that has already taken place; and a further rise seems certain to be necessary, as the rise in the price of cement had not so far been adequate." It is an ill-wind, &c. The calamitous events at San Francisco and Valparaiso have proved the safety of steel and concrete, or "reinforced concrete," structures; and from the Pacific Coast an excellent demand for cement has sprung. The improved condition of the cement market is an important factor in considering coke prospects. The cement market was dull; coke prices dropped. The demand for cement has improved, and makers are putting up their prices; coke must also derive advantage.

Locomotives and Waggons in Factories.

In another part of the "JOURNAL" will be found the amended draft regulations for the use of locomotives and waggons on lines and sidings in, or in connection with, factories, workshops, &c., which have been issued as the outcome of the inquiry held by Mr. Chester Jones towards the close of last year into the objections raised against the set of regulations issued some months previously by the Home Secretary, under section 79 of the Factory and Workshop Act, 1901. The subject was one which closely affected the larger gas undertakings, who, it may be remembered, were strongly represented at the inquiry. It was apparent, at the close of the evidence given for the Home Office by Sir Hamilton Freer-Smith, the Superintending Inspector for Dangerous Trades, that considerable modifications would have to be made in the regulations before they would meet the objections raised by the various parties (numbering 297) affected by them. These changes were, however, assented to by the Home Office; and, except with respect to one regulation (No. 1A), the differences between the Department and the objectors were eventually narrowed down to mere matters of drafting. Further modifications were suggested by Mr. Wills, the Counsel for the Home Office, which appeared to the Commissioner to satisfy all the objections raised; and the regulations were issued in the form given elsewhere. It will be seen from the portions of Mr. Chester Jones's report which accompany them that he is not altogether satisfied with Regulations 1 and 6, the enforcement of which so as to provide for the safety of the workmen, he thinks will be attended with difficulty. As to the former, he fears compliance with it will degenerate into an occupier making a set of rules which will either not get rid of the danger, or be impossible of enforcement; while as regards the latter, compliance would merely mean putting up a notice-board. What is really wanted, he says, is a regulation for each factory, and not one regulation for all factories. As this cannot be had, he thinks that the best course to take is to rely on the provisions of section 17 of the Factory and Workshop Act, 1901 (with possible slight amendment), the effect of which would be that each factory could be dealt with separately. With the exception of three (Nos. 2, 3, and 24), the regulations are to come into force on Jan. 1, 1907; the others a twelvemonth later.

The Terrible Earthquake at Valparaiso.

"At ten minutes to eight on the night of the 16th of August, Valparaiso, the chief port of the Pacific Coast, was a happy and prosperous city for the 200,000 souls living therein. At eight o'clock, its churches, theatres, hotels, commercial houses, and private dwellings had either been dashed to the ground or were in flames." This was the effect, as recorded by "The Star of Chile" for the 26th of August, a copy of which reached us yesterday, of four minutes of the earth's upheaval; and the result was the loss of about 5000 lives and of property to the estimated value of more than £30,000,000 sterling. The whole of the above-named paper (which could only be produced in a much smaller form than usual) is devoted to accounts of the disaster. The first shock, which lasted about a minute and a half, completely changed the appearance of the town. Buildings were thrown down in all directions, and the electric light being switched off at the power station left a great part of the town in darkness. The second shock was even stronger than the first, and others of less intensity occurred at intervals. In the Avenida de las Delicias, where the gas-works are situated, the church of the Doce Apostoles, which took more than thirty years to build, was practically in ruins; but the works suffered little in comparison with other parts of the town. Indeed, some of the gas-jets remained alight when the electric current was cut off; and we learn that by the end of the month only the examination and repair of the mains were necessary to allow of the resumption of the supply of gas. Fortunately, the Manager (Mr. F. Gibson) and his wife and two children escaped with their lives; but their house and furniture were wrecked. They must have had an experience never to be forgotten.

The Compulsory Rest-Day in France.

In the notice of the meeting of the Italian Gas Society which appeared in the "JOURNAL" for the 18th ult., it was mentioned that M. Coze, the President of the Société Technique, offered a few remarks on the subject of the law which has lately come into operation instituting a compulsory rest-day for workers in France, and its effect on the gas industry. He stated that a representative meeting was to be held in Paris, with the view of obtaining some expressions of opinion upon the subject. We learn from the current number of the "Journal de l'Eclairage au Gaz" that the meeting was held on the 22nd ult. under the chairmanship of M. Coze, who was assisted by the members of the Committees of the above-named Society and of the Syndicat Professionnel de l'Industrie du Gaz, of which M. Coze is also President; Me de la Taste, the Counsel to the latter body, being in attendance. M. Coze gave a succinct *résumé* of the new law, especially in its bearing upon gas companies, and Me de la Taste ocmmented in detail on the exemptions which it was intended to apply for to the proper authorities. A general vote was then taken to the effect that inasmuch as the operations carried on in gas-works are continuous, that danger might attend the introduction of temporary hands in place of those taking rest, and that existing concessions prevent an increase in the price of gas to compensate for any extra outlay incurred for labour, the new law should be interpreted broadly, and with all the exceptions contemplated by its framers. Subsequently, a series of nine resolutions were unanimously passed embodying the exemptions demanded, and M. Coze and Me de la Taste were thanked for the action they had taken in the matter. Before separating, a question was raised as to the right course to adopt for the time being; and it was thought best, seeing that the system of having a rest-day by rotation is already in operation in many gas-works, to leave things as they are.

GAS STOCK AND SHARE MARKET.

(For Stock and Share List, see p. 52.)

THINGS on the Stock Exchange last week were brighter than in the week before; but still there was a good bit of see-sawing from time to time, and movements either way were not of any magnitude. It was account week; and in anticipation of high contango rates, the earliest move was towards realizing. But as money appeared to be easing, the feeling of apprehension was allayed, and markets steadied. Subsequently, in the absence of any difficulties in the settlement showing themselves, the tone became fairly firm, and business more active. But the close was very quiet—largely owing to the Jewish Fast on Saturday. In the Money Market, rates opened easy for day-to-day requirements, but stiffer for the end of the month; and the Stock Exchange necessities and the wants at the close of the quarter produced a strong demand. Discount rates were firm. Business in the Gas Market was far from abundant; in fact, on some days it seemed more like holiday time in mid-August than the close of the season when people are coming back to work. There was very little movement in prices, but just enough to show that gas securities still stand well in the public estimation. And, indeed, so far as it is possible to see ahead into the future, there is no reason why they should not so stand. In Gaslight and Coke issues, the ordinary enjoyed its fair share of the aggregate of business done, and was remarkably steady at the previous week's prices. Marked transactions ranged from 99¼ to 100¼; the price most often marked being par. The secured issues were quiet. The maximum was done at 88¾ special, and 89¼; the preference at 109½; and the debenture at from 85¾ to 86½, the quotation being lowered a point. South Metropolitan was an exception to the general rule—being more than usually active. The tendency was firm; and prices ranged from 133 to 134, closing strong. The debenture was done at 86. Commercials were very quiet, with only a couple of transactions in the 4 per cent. at 113½, and one in the 3½ per cent. at 111. The Suburban and Provincial group had a few dealings in them, with no change except one or two variations on *ex div.* adjustment. British changed hands at 42¼ *cum div.*, and 40½ *ex div.* Bournemouth "B" marked 17 1/16, Southampton 110¾, and West Ham debenture 103½ and 104. On the local Exchange, Newcastle buyers advanced their price. In the Continental Companies, there was much quieter business. Imperial was done a few times at from 187 to 188; but at the close a parcel went at 186½. European fully-paid marked 24¾, and ditto part-paid 18 7/16. Union was not dealt in. Among the undertakings of the remoter world, Bombay changed hands at 7⅛, Cape Town at 15 *ex div.*, Buenos Ayres at 12⅜, Monte Video at 11⅞, Primitiva ordinary at 7 and 7 1/32, ditto preference at 5¼, and ditto debenture at from 97 to 98. River Plate was done at 13¼ and 13⅜.

The closing prices are shown in our Stock and Share List on page 52.

ELECTRIC LIGHTING MEMORANDA.

A Local Government Board Inquiry at Bristol—Payment of Permanent Employees' Wages out of Capital—Railway Carriage Lighting—A Fatal Accident with a Voltage of 200—Squeezing Cheltenham Ratepayers—The Opening of London Streets.

OFFICIALS of municipal authorities have no excuse now in not being prepared with very complete detailed information when they know they are coming before an Inspector of the Local Government Board in respect of an application for a loan. But with all the precedents before them, they face the Inspector totally unready to meet his scrutiny of the financial affairs of the department concerned; and, one after the other, they plead that they are unacquainted with the character of the information that is required. If this be true, it is quite time they learnt. But sometimes we cannot help entertaining a little suspicion, after the truth is out, that there are details that the officials would rather have had left unexposed. It was a regrettable thing that the application for a loan which the Bristol Corporation made earlier in the year, for £103,554, had, when it came before Mr. H. R. Hooper in July, to be postponed to September for the production of details on almost all heads, although the Bristol undertaking has nothing clinging about its administration of the same scandalous nature that was laid bare at the West Ham inquiry. Mr. Hooper is thorough and firm; and in Bristol over this substantial application, there is rejoicing that he insisted on accurate details, even though it gave the officials at headquarters some additional trouble. When the inquiry was resumed just recently, it transpired that, owing to the exactness required by the Inspector, various increases and deductions from the constituent items of the application had had to be made, which increased the total to £118,000. This shows the mistake of the impression that jumping at estimates is quite good enough for the Local Government Board. As the result of Mr. Hooper's investigation, he found that this sum could be reduced to £112,048; and then he looked into previous loans—finding as a result there were borrowing powers unexercised amounting to £14,407, against which had to be set a debit balance of £7391 excess expenditure on loans. Therefore the net amount available in borrowing power not exercised by the Corporation is £7016; so that the Inspector found that the net amount to be applied for was £105,032. In the course of the inquiry, one of the evils of municipal administration was shown—the tendency to charge everything possible to capital, even small items, and as little as possible to revenue. The vexed question of depreciation, and of fictitious values appearing in the accounts, also received notice. There was one instance of the latter introduced. A machine lying at the Avon Street station, now unused, is represented in the last balance-sheet by £2400; and the Inspector extracted the view, by a little patient handling of a witness, that perhaps £1000 may be obtained for it. Alderman Pearson, the Chairman of the Electricity Committee, all through this inquiry, appears to have been labouring under the impression that it was an investigation into his personal probity; but now that the excitement is over, perhaps he has found that it has had reference to a loan and to the general method of dealing with the finances of the department, for the responsibility for the administration of which, while he is the head, he is only one of a number.

In this Bristol inquiry, and also in one at Malvern, the Inspector has made it perfectly clear that it is not a passing whim of the Local Government Board, but a settled principle, that permanent employees of local authorities engaged on work entailing capital expenditure must not be paid out of capital, but out of revenue. We have now the reason for this; and this newly established principle in finance is certainly an economic one, even though it may occasionally work a little hardly. The Board's contention is that, when wages are charged on the borrowed capital of an undertaking, the ultimate cost is more than if they were paid out of revenue, in view of the interest that has to be met for some years. This ruling of the Board does not, of course, please Alderman Pearson, of Bristol; and he refused at the inquiry to give an undertaking as to what his Committee would do in the matter. But Mr. Hooper made short work of the objection by stating that, if the undertaking was not given, he was afraid the money required would not be advanced. In municipal spheres, all kinds of pressure—political, labour, and otherwise—is brought to bear to get favourable consideration; and concession is an easy way out of the difficulty, seeing that there is no personal financial responsibility involved. It is therefore necessary that there should be greater regulation of the decisive kind presented in this connection.

The deplorable Grantham railway catastrophe has again raised the question of the use of gas for the lighting of railway trains; and electricity and electrical apparatus purveyors have been busy trying to use this event to stem the favour in which incandescent gas lighting is rising in the railway world. Gas has never, so far as recollection serves, been known to cause a railway accident; and the production of disaster is not what trains are run for. In the "Birmingham Mail," we read that a railway official who believes that electric lighting is the light of the future for train illumination, has stated, to one of our contemporary's representatives, that "there is not an absolute immunity from danger with electricity, because, of course, the wires sometimes fuse"—in other words, there is the danger of electricity producing accident. In the "tubes," too, there have been some uncomfortable occurrences traceable to electricity; but that perhaps is another story. Still "people who live in glass houses should not throw stones."

But speaking of electrical accidents, a paragraph which went the round of the papers last week had attention attracted to it by the significant heading: "An Unknown Electrical Danger Revealed by a Fatal Accident." The occurrence has caused no little surprise among electricians. The scene was Derby; the victim a young butcher, who was described as a strong, muscular man. He was engaged in the simple operation of switching on an electric fan at the shop where he was employed, when he received an electric shock that caused his death. The medical evidence was to the effect that death was due to sudden failure of the heart consequent upon the shock. The voltage was the now common one of 200. The electrical witnesses could not call to mind an instance of a man being killed by such a comparatively low pressure before; and it was thought that the circumstances of the man standing in a briny puddle, with his hands covered with brine, as well as the fan, must have contributed to the fatal result. The electricians who gave evidence had never suspected conditions under which a voltage of 200 was not safe. But they will look for them now; and at the inquest it was suggested that, after this accident, electrical fans should be earthed. A verdict of "Accidental death" was returned; but the jury recommended that the risks of portable fans and other electrical apparatus should be carefully considered, and any necessary warning issued to those using them.

The story of how the ratepayers of Cheltenham are imposed upon is told by the accounts of the Corporation electricity undertaking for the year ending March 31 last. This concern has been an unfortunate one from its very birth. And so bad did things look—and they are little better now—that Mr. James Swinburne, it may be remembered, was called in some two years ago to investigate its position generally. What the ratepayers will now think of the recently issued accounts, we do not know; but outside observers will have no difficulty in arriving at the conclusion that the ratepayers are grossly treated in the way they are compelled to assist in maintaining this concern. The total revenue amounts to £23,576, of which the private business only produces £9801, and, for a small number of street lamps

(small relatively to the total charge) payment has to be made by the ratepayers to the tune of £8924, or only £877 less than the sum received for private lighting and power. The balance of the receipts is contributed by the tramways and meter-rents. But in addition to the sum of close upon £9000 for public lighting, there is this item on the receipts side of the account: "From general district rate, for interest and repayment of deficit loan, £1370." The debit balance at March, 1905, amounted to £16,869! After merely providing for sinking fund and interest for last year, there is a balance not allocated of £2573. But considering the foregoing figures, and that depreciation or reserve is not considered, this balance cannot be favourably regarded. The ratepayers of Cheltenham have good cause for looking dubiously upon the municipal management of their electricity business. It is an expensive one for them. It demands more to keep it on its legs than it can yield; and unless something in the nature of a miracle is performed, further evil days are clearly before the concern. For Cheltenham is not a place that can give much hope in, or scope to, a business saddled as this one is with an excessive capital expenditure.

It is a pleasure to find that the Borough Engineer of Kensington, in a report to his Council, confirms the views expressed in the "Memoranda" last week as to the irrational nature of the proposals of the London County Council regarding the promotion of legislation to compel all supply and other authorities using the subsoil of the streets for their distribution systems, to execute their work simultaneously, excepting such as can be described as emergency work. The impracticability of the proposal is apparent at first sight. The plan for preventing frequent obstruction of the roads, he further points out, would result in some of the principal thoroughfares in the Metropolis being annually barricaded at the same time. There is truth and humour combined in his assertion that a saving clause for cases of emergency would result in fully 90 per cent. of the work proving to be of the "emergency" class. But he goes on to spoil himself by his suggestion that legislation should be promoted to strengthen the hands of the Borough Councils in "supervising and controlling" the work carried out by statutory companies. At the present time, the Gas Companies anyway, in the matter of opening the roads, work amicably with the Borough Councils; and it is altogether unnecessary that there should be further supervision and control so far as they are concerned. That the regulation of the position, depth, and direction of mains should be entrusted to a Borough Engineer (we are not referring to Kensington any more than any other borough) who may be over-exacting and unreasonable in his views, is more than those who are more expert in these matters, and who know what is required in respect of convenience, safety, and service, could tolerate; and any application for such power would be greatly resisted. Seeing that the present law, at any rate, makes the Gas Companies responsible for all damage arising through any defect in the condition of their distribution system, the public have the best assurance that they will in future do, as they have done in the past, everything possible in their own protection and for the protection and best possible service of the public on whom they depend for their business.

The Founders of the Artificial Dye Industry.

In an article in a recent issue of the "Chemiker Zeitung" of which an abstract appears in the current number of the "Chemical Trade Journal," Herr H. Schelenz brings forward the claims of Ferdinand Runge to be considered one of the founders of the artificial dye industry, inasmuch as he was the first to separate aniline from coal tar in 1834. Runge was a man of wide knowledge, indefatigable industry, and great originality; but he obtained comparatively little honour in his own time, in consequence largely of his high-flown language, which rather set scientists against him. In addition to aniline, which he called "cyanol," Runge is credited with having discovered in coal tar another base and three acid bodies, among which was "carbol." These researches are alone considered to be sufficient to establish his title to fame. As early as 1826, the apothecary Unverdorben had prepared, by the dry distillation of indigo, a body which he called "crystallin." Both words, however, laboured under the disadvantage that they resembled too much others which had been taken into use for entirely different objects; and consequently they were superseded by a modification of the term "anil," which was applied to the substance by Fritsche, who, in 1843, at St. Petersburg, prepared it from indigo. "Anil" was derived from the word "nili," Sanscrit for blue, and "cyanol" from "κυαγοσ," signifying dark blue. The identity of the substance prepared in these different ways was established by Herr A. W. Hofmann; and, furthermore, when Zinin, in 1841, first made aniline by the now universal method of reducing nitrobenzene, the product was recognized by the blue coloration with bleaching powder solution—a reaction for which we are also indebted to Runge. The author thinks the foundations of the dye industry are to be regarded as having been to a great extent foreshadowed by Runge's work; moreover, the blue compound formed with bleach, and the yellow pigment he obtained from rosolic acid, may be considered as the first aniline dyes. But he says the greatest honour is nevertheless due to the later worker, who was really the first to make an actual practical success of the manufacture.

VARIATIONS IN THE HARCOURT TEN-CANDLE STANDARD LAMP.

In a communication to the last number of the "Electrical Review," Mr. J. S. Dow, B.Sc., gives particulars of experiments he has made at the Central Technical College, South Kensington, on possible sources of error in the use of the Harcourt ten-candle pentane lamp. In some cases, his experiments cover ground already worked by Mr. Paterson at the National Physical Laboratory and by Dr. Liebenthal and other observers at the Reichsanstalt. The publication of Mr. Dow's useful paper prompts a review of the conclusions arrived at by the several experimentalists; but, in the first instance, some general comments may be made on Mr. Dow's researches.

He used as standards of comparison three large-bulb 100-volt 50-candle power electric glow lamps, which were "aged" by being run off 100 volts for 50 hours. One of these was put aside to serve as a primary standard of reference, while the other two were used for the comparisons. The lamps were, in use, run from an independent battery of accumulators off 95 volts, at which pressure the colour of their light was the same as that of the pentane lamps. A carefully calibrated electrostatic voltmeter admitted of readings of pressure being made to 1-20th per cent.

Readers of the "Journal" will remember that the Metropolitan Gas Referees prescribe that the Harcourt lamp is to be used at a distance of 1 metre from the centre of its burner to the photoped, and with the rim of the burner 353 millimetres above a table. It may therefore be assumed that these are the normal conditions under which the lamps should be used. If the lamp is set at some other distance than 1 metre from the screen, and if the distance is measured from some point outside the central axis of the flame, and if the lamp is set up otherwise than as stated on a table, it is likely that the results of readings made with it will differ from those made with the lamp under normal conditions. Mr. Dow has considered the effect of bringing the screen nearer to or farther from the lamp (whereby the amount of flame illuminating the screen is slightly altered, because the effective cut-off is in front of the flame), and of measuring from another part of the flame; but he does not appear to have considered the effect of alterations in the air currents due to placing the lamp on a narrow bench or near a wall instead of on a central table. From the results obtained, one may conclude that if the distance is varied considerably, more uniform readings will be secured if the distance is measured from a point midway between the axis and the face of the flame instead of from the axis. Curiously enough, Mr. Dow does not actually give a reading for the normal distance of 1000 mm., but the values found for 1040 and 910 mm. are practically identical. Taking the former as normal, the following statement shows the effects of bringing the lamp nearer the screen and of measuring from the point midway between the axis and the face of the flame. The statement is deduced from Mr. Dow's results, which he states in a form in which they cannot be so readily referred to the normal value of the lamp.

Distance of Harcourt lamp from the photometer screen	mm. 1000	910	770	630	490	420	350
Candle power—							
(1) Distance measured from axis of flame . . .	10·00	10·01	10·03	10·07	10·18	10·27	10·45
(2) Distance measured from midway between axis and front of flame . .	9·90	9·90	9·90	9·91	9·99	10·02	10·08

Mr. Dow appears to think that because Dr. Liebenthal long ago preferred to take the midway point as representing the centre of illumination of the flame of one of the types of one-candle Harcourt standard, it should also be taken in the case of the present ten-candle standard. The form of the flames is, however, totally dissimilar, as one is a "solid" cone and the other an argand "hollow" ring flame, while the ten-candle standard is prescribed for use at a fixed distance of one metre—a fact which Mr. Dow seems to ignore.

The variation in the light afforded by the Harcourt ten-candle lamp with slight differences in the setting of the height of the flame was investigated by Mr. Dow with somewhat different conclusions from those arrived at at the Reichsanstalt [see "Journal," for July 10 last, p. 102]. He finds that when the tip of the flame is in its correct position (midway between the cross-bar and the bottom of the mica window) it has its maximum power, from which it falls off by about 0·5 per cent., when the tip is either ¼ inch above or ¼ inch below that position—this being the range over which the setting is allowed to vary under the prescription of the Metropolitan Gas Referees. At the Reichsanstalt, however, it was found that there was little difference if the flame was set ¼ inch above the correct height, but that there was a considerable reduction if it was set below it. With the points of the flame playing about the lower edge of the mica window—*i.e.*, considerably below the lower limit—the light is about 3 per cent. below the normal according to the Reichsanstalt, and about 2 per cent. below according to Mr. Dow. The statements made in the Gas Referees' prescription, to the effect that the height of pentane in the saturator may fall to within one-eighth of an inch as seen against the windows, and that the lamp is to be kept burning for

at least ten minutes before any testing is made, are shown by Mr. Dow's observations to be in the main adequate safeguards.

In regard to the effect of vitiation of the air by breathing or combustion on the light afforded by the Harcourt lamp, Mr. Dow found a considerable falling off even when the vitiation was not excessive. The proportion of carbonic acid in the air does not, however, appear to have been determined; so that his conclusions are not so useful as they would otherwise have been. In the Reichsanstalt photometer-room of 16,600 cubic feet capacity, the light of the lamp frequently decreased by 2 per cent. in 20 minutes owing to vitiation of the air. In the room used by Mr. Dow (30 feet by 36 feet area; height or cubical contents not stated), the light did not change appreciably when only one worker was there. The presence of a second person and the burning of two gas-jets in the room reduced the light by about 2 per cent. in 50 minutes. Mr. Dow thinks the effect of vitiation is mainly attributable to the deficiency of oxygen, rather than to the surplus of carbonic acid in the vitiated air; and there is no question the first factor is likely to be at least as potent as the second, though its importance is less generally recognized.

In regard to the effect of variations in barometric height and humidity, Mr. Dow made independent observations, which may be usefully considered with the results obtained elsewhere.

—	Average Decrease in Light of Lamp for Each Addition of One Volume of Water Vapour to 1000 Volumes of Dry Air.	Average Increase in Light of Lamp for Each Addition of 10 mm. in the Barometric Height.
Reichsanstalt*	0·55 per cent.	0·60 per cent.
C. C. Paterson (Nat. Phys. Lab.)†	0·66 ,, ,,	0·80 ,, ,,
J. S. Dow (Cent. Tech. Col.) . .	0·71 ,, ,,	0·85 ,, ,,

* See "JOURNAL," Vol. XCV., p. 102. † *Ibid.*, Vol. LXXXVII., p. 606.

It is interesting to note that the Reichsanstalt found smaller variations than the observers at the two English institutions. Mr. Dow appears to write in ignorance of the work done at the Reichsanstalt. His own is unfortunately marred by the fact that he is under the impression that the correct gauge-block for setting the height of the chimney-tube in the Harcourt lamp is about 46 mm. in length; and no doubt he used such a block in his experiments. The correct height of the block, according to the Gas Referees' Notification, is 47 mm.; and there is no question that an error of approximately 1 mm. in this all-important dimension would not be tolerated. It is to be hoped that Mr. Dow will see his way to continue his valuable researches on the lamp, using a correct gauge-block, and otherwise treating the lamp in the way it is intended to be used by the inventor and his official colleagues.

THE "DOWSER" UNDER THE SEARCH-LIGHT.

It will doubtless be in the recollection of some of our readers that early in 1905 we published three articles on the subject of finding water by means of the divining-rod. They did not embody the results of any original investigations, but merely presented in an epitomized form a mass of correspondence which had for some weeks been appearing in "The Times." It was opened by Professor Wertheimer, the Principal of the Merchant Venturers' Technical College, Bristol, who stated that an opportunity had occurred to him for carrying out a scientific test of a water-finder's powers, and asked to have placed at his disposal some ground having beneath it a stream of water the course of which was accurately known. The utility of the proposed test was questioned by certain parties, who evidently regarded the "dowser" as nothing more than a trickster. On the other hand, evidence was brought forward of some remarkable cases of divination, which seemed to dispel the notion of imposition, and to justify the belief in the possession by some people of an occult force which only required the existence of particular conditions to bring it into action. It was doubtless this belief that led the Society for Psychical Research to place the matter in the hands of Mr. W. F. Barrett, the Professor of Experimental Physics in the Royal College of Science for Ireland. The results of his preliminary investigations were duly published; and it was understood that he was engaged upon further researches of which the outcome would be made known in due course. We are not aware whether or not this has been done; but, at all events, in his early contributions to the literature of the subject he showed that the claims of the water-finder were worthy of thorough investigation. This view was shared by the late Mr. James Mansergh, who, sceptical as he admitted he was as to the powers of the "dowser," acknowledged that the work done by him could not be lightly pooh-poohed or ignored; and, speaking in the capacity of President of the Institution of Civil Engineers, he expressed his willingness to formulate certain crucial tests to which, if opportunity occurred, he would invite two or three of the leading water-finders to submit themselves, and lay the results before the members of the Institution. Unfortunately, the opportunity never occurred; but some such investigation as that contemplated by Mr. Mansergh has been carried out by Professor Wertheimer. It extended over several months; and the results have just been communicated to the paper in which his request for assistance was first brought under notice.

Professor Wertheimer approached the subject with a perfectly open mind—he was quite neutral. He says that while he would have been glad if the results of the experiments had shown that there was "a new unknown external force," he was fully aware of the possibility of persons misleading themselves in such matters, and "mistaking subjective for objective effects." He carried out altogether 28 experiments, which may be classified as follows: (1) Experiments to find known wells or water channels feeding them; (2) experiments to ascertain if the motion of the divining-rod is due to an electrical cause; (3) experiments to find a known underground channel; (4) comparisons of results obtained by different dowsers on the same spots; (5) experiments to discover when water is or is not flowing in an iron pipe; and (6) experiments to find gold and silver. Three professional and a like number of amateur water-finders took part in the tests. The first experiments were carried out in the grounds of Downside Abbey on July 18 last year, and Professor Wertheimer says the water-finder "was successful to an extent that cannot be accounted for by mere chance." The result, however, was to convince him that the method adopted was not a satisfactory one in the case of this particular operator. He therefore tested him on an iron pipe, the water passing through which was occasionally shut off. At first he failed to indicate the change; but subsequently on four occasions out of ten he correctly stated whether or not water was flowing. Eight students of the Merchant Venturers' College, however, by mere guesswork, were successful, on an average, four times out of ten. The water-finder admitted his failure, but attributed it to someone influencing him, consciously or unconsciously, by "thought transference."

The possibility of the motion of the water-finder's twig being due to some electrical cause was investigated, but with negative results. Five experiments were undertaken to ascertain whether a known underground channel could be located. The operator passed over it six times, on only three of which did his rod give indications of the presence of water beneath. Consequently, the experiment did not afford any evidence that the rod would turn with any certainty when held over running water. The operator here was a professional dowser, supported by testimonials; and the fact that he was only partially successful is attributed to more or less continuous rain for three days before the test. Three experienced water-finders experimented in the kitchen at Brislington Hall; but they did not agree with each other in their predictions. The last set of experiments included those intended to test the claim of diviners to be able, by means of the rod, to indicate the presence of hidden gold or silver. With these, however, we are not concerned. Details of the tests are given; and opportunity may be taken of reverting to them in a future issue.

The conclusion arrived at by Professor Wertheimer from his experiments, so far as they have gone, is that the motion of the diviner's rod and the sensations he experiences are not due to any cause outside himself. Unfortunately, the investigations do not furnish a definite answer to the question whether or not dowsers have the power to find water; so that we are left very much in the old position. The Professor, however, thinks they show, first, that experienced dowsers "do not give the same indications in the same place;" and, secondly, that the movements of their rods were, in several of the experiments described, "due partly to subjective causes." The accounts of the experiments were shown to the operators, who, in most cases, were quite prepared to explain away any want of success on their part. But Professor Wertheimer says that in many cases the explanations were of a somewhat cryptic character. There is apparently, we are told, "a vein of mysticism" in the minds of most dowsers; though not a few of them are "hard-headed men of business." It is to be regretted that the investigations of which we have given an outline have not resulted in more definite conclusions; but Professor Wertheimer is none the less deserving of thanks for having instituted them. His record will be always valuable for future reference.

Tar for Repairing Tank Leaks.

In view of the attention which is now being given to the various means of utilizing coal tar, it may be of interest to reproduce from a recent number of "Engineering News" some particulars in regard to what is being done by the United States Government in the employment of this material for the under-water protection and damp-proofing of fortifications. The process adopted at Fort Screven (Ga.) has been selected, as the conditions there are in several respects similar to those which might be found in concrete gasholder tanks. The passages and magazines were damp and wet, and this has been remedied satisfactorily by the following treatment: All cracks in the horizontal surface of the concrete were cut out 1 inch wide and ¾ inch deep (some large cracks were cut wider), the cracks cleaned out, and hot asphalte mixture poured in and ironed down smooth with the surface of the concrete. After the cracks were finished, all the exposed horizontal surfaces of the concrete were painted with two coats of boiled linseed oil and lampblack, applied hot. All the vertical surfaces were painted with two coats of plain boiled oil and then one coat of slate colour (lead, oil, and lampblack). The concrete should be dry and the weather warm when the oil is applied. Later, one coat of tar paint was applied to the parapet surface. This paint was composed only of coal tar, asphalte, and coal oil—4 gallons of tar to 1 gallon each of the two other ingredients.

THE DIFFICULTIES OF DISPOSING OF AMMONIA-SPENT LIQUOR, AND CERTAIN RESULTS OF ITS PURIFICATION.

By JOHN RADCLIFFE.

GAS, coke-oven, and chemical works which make large volumes of this waste product, now find it difficult to dispose of without trouble ensuing with one or other of the various authorities with whom they may come into conflict; and those works are exceptionally situated which find themselves able to safely select one of the several means available.

When the works were fewer in number, and the temperatures of distillation were not high in degree, no doubt the liquor was discharged, and eventually entered the natural channels, which are watercourses, without unduly depreciating their value for any purpose; but with the development of the industries, and the attainment of high retort temperatures, the accumulation of injurious substances—more particularly phenolic bodies and compounds of cyanogen—can be so great that the Rivers Boards, Fisheries Commissions, and Sanitary and Water-Supply Authorities have been obliged to call attention to the damage and injury which may be done. In a large number of instances, prohibition of discharge from works has been issued. There are works which have found it necessary to cease the distillation of ammonia, shut down the plant, and sell the liquor for whatever it will bring them. And there are indications leading to the conclusion that the Rivers Boards in different parts of the country will no longer permit the discharge of the spent liquor into watercourses, indirectly or directly. Works placed on the coast as a rule have nothing to fear; but others on estuaries which are fishing-grounds, have had to avoid discharging the crude effluent to the sea.

Some works situated inland allow it to percolate the earth; and where the underlying strata are deep and porous, the method is a safe one. But if shallow—that is to say, if the effluent cannot sink below the level of streams adjacent, it is bound eventually to appear in them. Fortunately or unfortunately, the analytical test for the most objectionable of its constituents is extremely sensitive and unmistakable; so that the presence of spent liquor can be ascertained with certainty, and its proportion inferred.

Other works are obliged to have recourse to very expensive evaporation until solid residue is obtained which is carried away. Sometimes a portion of the evaporation is done in boilers for steam raising—to the damage of the fittings—and is a mere postponement of the trouble. There are coke-oven plants using again for gas-washing the liquor from which the free ammonia only has been removed, and the cycle of operations continued until the ammonia-liquor is satured with fixed ammonium salts. It is then decomposed with lime, and a concentrated spent liquor obtained. This is evaporated; and the solid residue is carried away as in the previous instance. But these residues still contain all the objectionable impurities of the original liquor. If the mass is buried, being deliquescent it soon becomes fluid, and drains away unless confined in water-tight pits. If thrown on to the land, it must be percolated through the earth by rain, and washed into watercourses eventually; and then the distiller arrives at exactly the same end (after spending a lot of money) as if he had pumped the spent-liquor on to the land or run it into a stream.

There is much difference of opinion as to what is the effect of spent liquor upon sewage treatment when passed into the works' drains; and as in most cases this method of disposal will be the readiest and most convenient, it is necessary to more closely consider it.

If the subsequent treatment of sewage consists in the removal of solid matter by lime and materials of a similar character, the cyanogen compounds will remain in solution, and the prohibition of the Rivers Boards against discharge may be applied. If the treatment consists in pumping the sewage upon land to be afterwards cultivated, the spent liquor in some instances has not been found to hinder vegetable growth, but in most cases has been found to seriously interfere with it. The result will depend upon the proportion present, and its composition. Usually the proportion of the spent liquor will be under 1 per cent.; and should it hold about this amount, and the liquor contain under the equivalent of 0·15 per cent. of ammonium sulphocyanide and be free from tar particles, with the phenolic compounds low in amount and be not immoderately alkaline, the probability is that cultivation will not be interfered with, and the bacteria of the soil and the sewage will be able to decompose the salts of the liquor. If, however, the water supply is only a small one and the proportion of liquor increased, or, as is usually the case, has a larger amount of injurious compounds present than that indicated, vegetable growth will be retarded, or even prevented; the sewage matter will not be quickly absorbed; and the salts of the liquor will remain longer undecomposed, with the serious consequences of both remaining a dangerous period of time on the land with all the accompanying risks.

If the system of treatment is the modern one of septic tanks, the same remarks apply as in the previous instance; and each case must be considered in relation to all the circumstances of it. The consequences will be dependent upon the proportion of spent liquor, its composition, and the degree of aëration arrived at in the beds. It is obvious this must be the case. There are exceptional instances of works which have passed their liquor to bacteria beds without damage to them being reported; but statements have been made in general terms that this material is not injurious. The experiences of the Sutton (Surrey) Gas Company may be cited to show otherwise. The double-contact bacterial beds for the treatment of sewage were first devised by Mr. Dibdin, who originated the system; and the first beds in this or in any country were put down at Sutton twenty years ago, and have been a model for all others. Public bodies from all parts of the world have visited and copied them. The Engineer at the time of inception was Mr. Chambers Smith, who, during the whole time up to the present, has had the system under his charge on behalf of the District Council.

The Sutton Gas Company up to March, 1905, sold their ammoniacal liquor. In April they had built a sulphate-house, put down a new sulphate plant of the most modern type (the devil liquor being redistilled), and began to work it. The spent liquor was passed to the sewers. Compared with some others, it may be said to be a rather harmless liquor, containing the equivalent of 0·15 per cent. of ammonium sulphocyanide and a proportionate amount of other impurities. The volume added was 3 per cent. Soon after the plant started, it was reported that the quality of the sewage-effluent had become deteriorated. Reports are regularly made. In a few days the sewage-effluent had a foul smell, and the beds became completely ineffective. The Medical Officer of Health (Dr. Bower) examined them, and found that most of the bacteria were killed, and those that were not dead were undeveloped, enfeebled visibly, and ineffective. The sulphate plant worked for three weeks and then stopped; and the trouble at the sewage beds thereupon vanished. The gas-works went back to their practice of selling ammoniacal liquor, and the trouble at the beds did not recur. It appeared that the Company were not correctly informed of the volume of sewage with which the liquor would be mixed. The experience of the Waltham Abbey Gas Company is precisely the same. The sulphate plant was stopped nearly two years on account of the same difficulty. It seems in many cases that, if ammonia plants are to work at all, a process of liquor purification is essential.

In August, 1905, the Sutton Gas Company, who were standing to lose a lot of money, instructed the writer to put down purification plant, which began to work in September. It fulfilled the requirements in being inexpensive and simple, and resulted in the continuous and automatic removal of free lime, tar particles, organic ammonia, sulphocyanides, cyanides, ferrocyanides, and sulphides, and also compounds of dithiocyanogen, which the writer has observed in many samples of spent liquor. Samples of the purified effluent were submitted by the Council to Dr. Bower, who reported: "To various proportions of crude sewage from the farm were added 1 per cent., 5 per cent., and 25 per cent. of the purified effluent from the sulphate of ammonia plant, and cultivation experiments made. I found that bacterial growth was not appreciably inhibited by any less quantity than 25 per cent. of the effluent." The Clinical Research Association also reported to Dr. Bower as follows: "A 1 per cent. dilution is without action on the colon bacillus, which, in fact, grows freely in nutrient broth containing this amount of fluid." The Gas Company sent samples to Dr. Otto Hehner, who reported:

I procured some sewage effluent from the Metropolitan Northern Outfall Works at Beckton, and added to measured quantities of it (after straining out the coarser particles by filtration through cotton wool) various proportions of the (purified) ammonia plant effluent. These mixtures I kept at about 32° C. (a little below blood heat) for some 5 hours, so as to give to the chemicals contained in the liquor a due chance of injuriously affecting the bacteria. I, at the same time, incubated a sample of the sewage without addition of effluent. From each incubated sample I then prepared dilutions from which I cultivated gelatine plates and agar plates—the former at ordinary temperature; the latter at blood heat. The number of colonies that had developed were ascertained; and the results are stated in the following table, in which due allowance is made for the dilution of the sewage by the addition of the purified gas effluent.

Gelatine Cultures.

	Total No. of Bacteria per c.c. of Sewage.
Sewage without addition	2,419,000
,, *plus* 4 per cent. of purified effluent	2,337,000
,, ,, 6 ,, ,, ,,	2,475,000
,, ,, 8 ,, ,, ,,	3,211,000
,, ,, 12 ,, ,, ,,	3,846,000
,, ,, 16 ,, ,, ,,	3,717,000

Agar Cultures at Blood Heat.

Sewage without addition	1,058,000
,, *plus* 4 per cent. of purified effluent	1,576,000
,, ,, 6 ,, ,, ,,	1,800,000
,, ,, 8 ,, ,, ,,	1,844,000
,, ,, 12 ,, ,, ,,	2,933,000
,, ,, 16 ,, ,, ,,	1,753,000

It is abundantly clear from the above results that this effluent, when added to sewage in proportions up to 12 per cent., has not only not antiseptic bactericidal action, but greatly stimulates their growth and development; almost twice as many bacteria developing in gelatine, and three times as many with agar at blood heat in the presence of 12 per cent. of liquor than in sewage alone. It is clear that the liquor furnishes some food materials to bacterial life.

When the proportion of effluent exceeds 12 per cent., a slight inhibitive effect begins to appear; but even with 16 per cent., the bacterial

development is considerably greater than in pure sewage. The discharge of purified effluent, of the nature of the sample upon which I experimented, into the Sutton sewers therefore *assists the proper working of the bacteria beds in which the sewage is treated*, and is without the least injurious influence.

This conclusion was placed before Mr. Dibdin, who stated that, when sufficient of the poisonous substances was removed, the bacteria would be able to decompose and feed upon the remaining salts.

Upon the strength of these reports, the Gas Company, who had in the meantime been using the purified effluent for works purposes, passed it into the drains, in the same proportion as before—viz., 3 per cent.; and the results have justified expectations. It has been going to the beds right up to the present time; and Mr. Chambers Smith has stated there are no complaints to make. The sulphate plant works three weeks and stops two; and an observer who regularly sees the sewage effluent vouches that when the purified liquor is passing to the beds, the quality of the sewage effluent is improved. As the proportion added will always be under 3 per cent., and in most cases 1 per cent., the effectiveness of the treatment is apparent, as 25 per cent. can be safely added. A similar purification plant is now working at Waltham Abbey, and the results are equally good. The Corporation of Coventry are adopting the process for their new works at Foleshill, and other works also.

I think it can now be stated that ammonia spent liquor, in some instances, injures bacteria beds, and, further, that it is possible to purify it, with the result of it being beneficial. Purification, indeed, affords the simplest solution of the problem.

COMPOSITION AND VALUATION OF OILS USED FOR GAS-MAKING PURPOSES.

By H. Leicester Greville, F.I.C., F.C.S., &c.

Under the above title (as was noticed in last week's "Journal"), "The Analyst" publishes in its current number the full text of a paper read at the meeting on June 14, by Mr. Raymond Ross, F.I.C., and Mr. J. P. Leather. It is needless to say that the question discussed and investigated is an important one, and should be of great interest to the gas industry. With the adoption of a lower quality illuminating gas, it may be considered that processes of enrichment are of decreasing interest. This, however, is not the case. So long as gas has to be manufactured to conform to the requirement of developing a certain candle power as tested by any burner, apart from those of the incandescent type, so long will it be necessary in the domain of water gas to consider the value of the oils available, for the purpose of producing a gas conforming to the parliamentary standards with regard to its luminosity.

The authors of the paper treat the subject from a scientific point of view. The results of gasification of various oils are given with exact definition of the temperature used, by an electrical pyrometer. The respective oils were also examined as to their behaviour on fractional distillation and refractive index. A table is given as to the specific gravities and general characteristics of the fractions obtained by distillation at different temperatures. A special chemical examination was also made with the view of determining the composition of the oils. All this has, however, probably little interest for the average gas manager; but there are certain features in the investigation which are well worth study from a practical point of view. It is somewhat unfortunate that the authors have expressed their practical results in an empirical way. The method of gasification was by means of a retort—about 9 inches long by 5¾ inches wide and 4¾ inches in height—heated in a muffle furnace. The oil was introduced by a tube which passed only a short distance into the retort; the tube for the outlet gases extending to the whole length of the retort. It is doubtful whether this arrangement was the best that could have been devised to secure the maximum possible result; but as the conditions were the same in all the tests, the respective results are strictly comparable.

It is unfortunate with regard to the figures given in the table last week (p. 825) that the illuminating power of the respective gases is not stated, also that the volumes obtained are not expressed in a manner more comprehensible to a practical man. With regard to respective volumes, however, a simple expedient will suffice to render the figures more intelligible. Divide the numbers in column 2 by 6·25 (the number of gallons to the cubic foot), and the result gives the cubic feet per gallon. Thus for Pennsylvanian oil, at 1260° Fahr., with a yield of 445 c.c.—

$$\frac{445}{6{\cdot}25} = 71 \text{ cubic feet per gallon.}$$

Taking the general results indicated in the table, there are several noticeable features. The volume obtained at different temperatures nearly always increases with the augmentation of heat. This is what would be anticipated. The valuation figure, on the other hand, varies with different oils at varying heats. The valuation figure being a product of the multiplication of the volume by the percentage of hydrocarbons, it must be assumed—in the absence of actual lighting power determinations—that there is a special temperature at which each class of oil gives the best result on "cracking." Pennsylvanian gives the highest figure at 1400° Fahr.; Kansas, at 1260°; Russian, at 1260°; Russian refined, at 1510°; Texas, at 1400°; Californian, at 1400°; Roumanian, at 1400°; Grosny, at 1260°; Borneo, at 1260°; and Scotch, at 1260°. The practical value of the figures is that they point to the advisability in ordinary working of using an accurate pyrometer, and modifying the temperature of "cracking" with the class of oil employed.

Some practical experiments on a large scale were made by the authors of the paper under discussion, in which the oils were used in a carburetted water-gas plant erected by the Economical Gas Apparatus Construction Company, with the following results:—

Pennsylvanian Oil.

Laboratory valuation figure, 16,000.
Oil at 2·47 gallons per 1000 cubic feet.
Average candle power, 22·12 = 8·9 candles per gallon per 1000 cubic feet.
Coke used in generator, 33·9 lbs. per 1000 cubic feet.

Russian Oil.

Laboratory valuation figure, 15,927.
Oil at 2·59 gallons per 1000 cubic feet.
Average candle power, 22·61 = 8·73 candles per gallon per 1000 cubic feet.
Coke used in generator, 32·5 lbs. per 1000 cubic feet.

Texas Oil.

Laboratory valuation figure, 11,697.
Oil at 3·277 gallons per 1000 cubic feet.
Average candle power, 20·51 = 6·2 candles per gallon per 1000 cubic feet.
Coke used in generator, 35·07 lbs. per 1000 cubic feet.

Borneo Oil.

Laboratory valuation figure, 8024.
Oil at 3·63 gallons per 1000 cubic feet.
Average candle power, 17·03 = 4·69 candles per gallon per 1000 cubic feet.
Coke used in generator, 33 lbs. per 1000 cubic feet.

It must not be forgotten that, in all cases where volume of gas is given per measure of oil, although the measures are equal, the corresponding weights are not, but vary with the respective specific gravities. These are not given in the paper; the authors considering the specific gravity of the fractions boiling between 280° C. and 300° C. sufficient for their purpose.

The figures given for specific gravities are—

Pennsylvanian	0·833	Roumanian	0·882
Russian	0·862	Borneo	0·936
Texas	0·895	Kansas	0·850
Scotch	Not given, but estimated as lower.		

From a chemical examination of the oils, the authors conclude that—

1.—The open chain compounds have the best value for gas-making purposes.
2.—The presence of double bands in the chain slightly decreases the value.
3.—The presence of one or more rings diminishes the value considerably.
4.—The more freely hydrogenated the ring, the better its value as compared with other ring compounds.
5.—Benzene rings have practically no value for cracking purposes.

The paper is, the authors consider, worthy of careful perusal and study by those who wish to glean more information on the essentially chemical side of the question.

Large Gas-Engines.—Our contemporary "Stahl und Eisen" are devoting a portion of their columns to the description of large gas-engines employed in German works; and some particularly large ones are mentioned. There are illustrated and described one of 2000-horse power, built by the Deutz Gas-Motor Company; two tandem gas-blowing engines, each of 1500-horse power, built by the Alsacian Machine Construction Company at Mülhausen; a 1500-horse power tandem gas-engine built by the Märkischen Machine Factory; a 1200-horse power gas-dynamo built by Schüchtermann and Kremer, of Dortmund; and several other considerable sized engines.

Dust-Prevention Experiments at Birmingham.—The Birmingham City Surveyor is continuing, under the auspices of the Works Committee, experiments with a view to preventing the raising of dust by motor-car traffic upon macadamized roads. One of the most promising methods, in his opinion, is the treatment of the road surface with oil-gas tar. Westbourne Road was selected for this method of treatment, with the result, it is said, that there has been practically an absence of dust upon the thoroughfare. To secure the desired objects, it is only necessary to apply two thin coats of the tar. It is essential that the surface of the road be in a good condition before the liquid is applied; the application being made either by means of brushes or sprinklers. One of the many advantages which the oil-gas tar possesses is that the road may be thrown open for traffic immediately after its application.

OBITUARY.

The death took place on the 27th of August of Herr F. E. A. WILLE, the Manager of the municipal gas and water undertakings of Hildesheim. He had attained the age of 62.

The death is announced as having taken place on the 16th of August of Herr CARL FRIEDRICH, the Manager of the gas-works at Eisleben. He had nearly completed his 61st year.

The death occurred recently, at the advanced age of 86, of Mr. WILLIAM HENRY WESTWOOD, principal of the firm of Messrs. Westwood and Wrights, of Brierley Hill. He was a Director of the Brierley Hill and Dudley Gas Companies, and was for some time Chairman of the former Company.

PERSONAL.

Mr. FREDERICK TAYLOR, the Secretary of the Warrington Corporation Gas Department, was last Friday, in the Inspector's Room of the Mersey Street Gas-Works, presented with a beautifully framed photograph of the meter inspectors. Senior Inspector E. Clough, in a few, well-chosen words, asked Mr. Taylor's acceptance of the present; and his remarks were supplemented by Inspector R. Lees, who expressed the hope that Mr. Taylor would live long to enjoy the remembrance of the feelings which had prompted the presentation. Other expressions testifying to the great esteem in which the recipient was held were made. In replying, Mr. Taylor said he was quite taken by surprise; he could only say that he appreciated very much the present, and hoped that the same good feeling would continue among them.

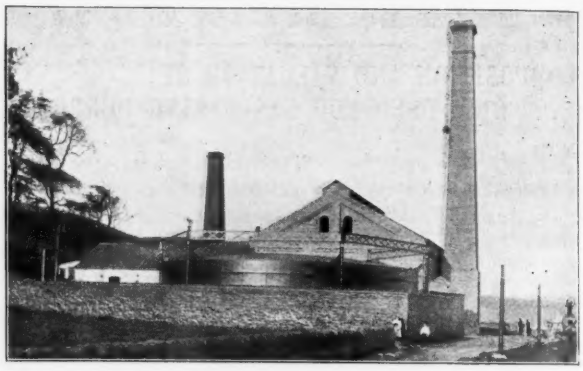
Last Friday afternoon, Mr. WILLIAM PARLBY, who has just relinquished the position of Gas Engineer and Manager to the Hereford Corporation, was the recipient of a testimonial, subscribed for by the employees as a mark of their appreciation of him. It consisted of a handsome ebony walking-stick with ivory handle, and an electro-silver card-tray, each bearing a suitable inscription. The presentation was made by Mr. George Williams, the oldest workman, who said he had been asked to express the regret of the employees at Mr. Parlby's retirement, and to say how much they had appreciated his various kindnesses during the many years they had had the pleasure of serving under his management. He also wished to include Mrs. Parlby in this expression, for her kindness to the families around the works during times of sickness and trouble. Mr. Parlby, in acknowledging the gifts, asked the donors to accept his very sincere and grateful thanks for them, and also for the kind feelings which had prompted their presentation. He said he was reminded of the time when, some 22 years ago, he came from Sheffield to Hereford to undertake the control of the gas-works. The number of customers then was 1129; and he was leaving to his successor about 4000. At that time there were no cooking-stoves; whereas now there were many hundreds, and upwards of 2000 slot cookers. The amount of the capital debt which had been extinguished on the gas-works at the time of his appointment was £15,878. It was now £95,000; so that about £80,000 had been paid off out of profits in his time. Then the price of the gas had been greatly reduced; the actual concessions being equal to from £6000 to £7000 per annum on the total quantity of gas consumed compared with what the price would work out when the works were purchased. In retiring from the management, he desired to convey to all those who had worked under him his appreciation of their services. He was sure he had had the loyal co-operation of the employees, without which it would have been quite impossible to achieve success. In severing his official connection with the gas undertaking, he should always look back with pleasure on his association with such a body of men, whose interests, as well as those of the ratepayers, he had endeavoured to serve to the best of his power and ability, consistent with his sense of duty. Mrs. Parlby was also presented by the wives of the workmen with a silver cake-tray and bread-fork, as an expression of the kindly feeling they have always entertained for her.

"Water and Its Work" was the title of a lecture that was delivered at Colchester recently by Professor Vivian B. Lewes, in connection with the Gilchrist Educational Trust. The lecture, which included numerous experiments, was much enjoyed by a large audience.

Mr. H. O'Connor's Classes in "Gas Manufacture."—The classes in "Gas Manufacture" conducted by Mr. Henry O'Connor, F.R.S.E., &c., in the Glasgow and West of Scotland Technical College, opened on Saturday last. Mr. O'Connor this year will treat upon the earlier portion of gas-making operations; and another series of lectures will be devoted to the distribution of gas. The former will be suitable for students interested in manufacture, and the latter for those engaged in the outdoor departments, while they will also be of assistance to any who have already the necessary knowledge of gas making. Mr. O'Connor will also lecture at the Heriot-Watt College, Edinburgh, on "Gas Manufacture," Part I. This series begins next Friday.

GAS-WORKS EXTENSIONS AT EAST WEMYSS AND BUCKHAVEN.

THE opening of a tramway line between Kirkcaldy and Leven, in Fifeshire, has led to much new building along the route. In respect of the resulting large augmentation in the consumption of gas, and in view of further increase expected, the East Wemyss and Buckhaven Gas Company, who serve part of the district, have been engaged in the renovation and extension of their works. This having been completed, the ceremony of formally opening them, as well as of celebrating the Diamond Jubilee of the Company, took place on the afternoon of Saturday, the 22nd ult. Ex-Provost Gillespie, of Buckhaven, the Chairman of the Company, charged a retort, in the presence of a large representative gathering of invited guests. Thereafter refreshments were served in the retort-house. The Chairman there welcomed the party, and expressed the gratification of the Directors at the completion of the important works in which they had been engaged. The company were subsequently entertained at dinner in the Randolph Hotel, Buckhaven; Mr. Gillespie being again in the chair. A long toast-list was gone through; among those taking part in the proceedings being Messrs. W. Mitchell, of Dundee, P. L. Readdie, of Leven, H. Gourlay, the Manager, and A. Morton Fyffe, of Dundee, the Engineer, W. Blair, of Helensburgh, and R. Hislop, of Paisley.



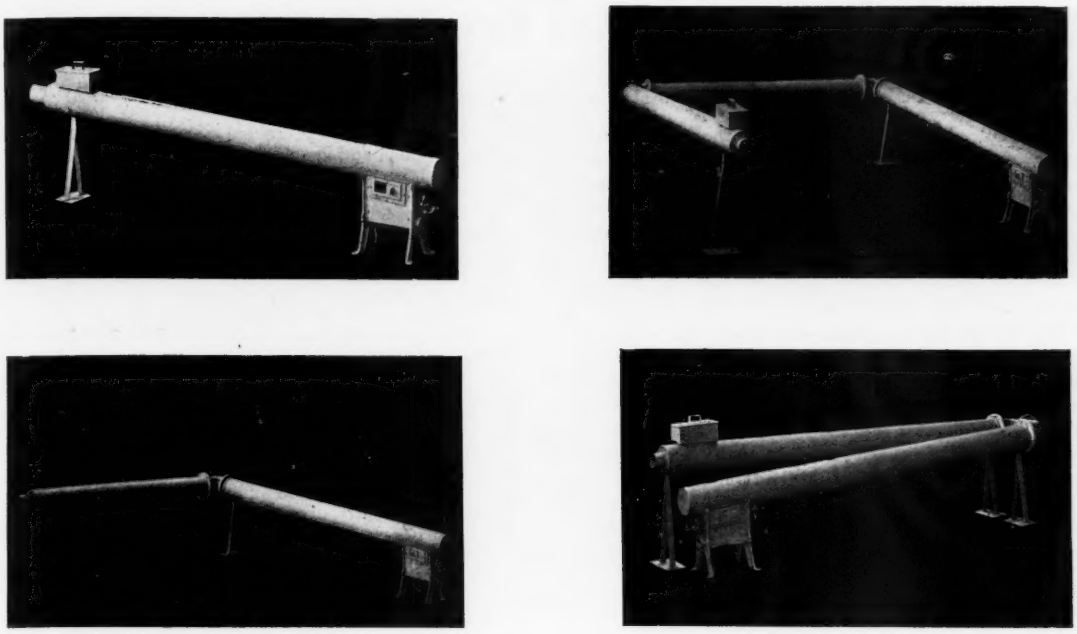
View of the New East Wemyss and Buckhaven Gas-Works.

The works, which have been designed by Mr. A. Morton Fyffe, include a new retort-house, built of Muir edge composition brick, with panels and full gables. The house is 45 feet square and 30 feet high. It contains a bench of three settings of eights (two of which have been filled), on the regenerative principle of Messrs. R. & G. Hislop, of Paisley. There is a square chimney, 80 feet high, lined to a height of 25 feet with Bonnybridge fire-brick. The roof of the retort-house is of iron, and was erected by Messrs. Bryden and Middleton, of Glasgow. A vertical steam-boiler was supplied by Mr. Bryce, of Kirkcaldy; and a cart steelyard by Messrs. H. Pooley and Son. A new 4-inch main, of Mannesmann tubes, has been laid to Buckhaven, a distance of two miles. Negotiations are at present proceeding for the construction of a railway siding into the works, with a coal-shoot, coke-conveyor, and tar-pumps, and the erection of offices, with Board-room; and dwelling-houses for the Manager and the workmen are in contemplation. The ironwork for the retort-bench was supplied, under sub-contract, by Messrs. Henry Balfour and Co., Limited, of Leven; and the building of the retort-bench was supervised by Mr. W. Mitchell, of Dundee. The cost of the extensions was about £2000.

THE HEATING OF CONSERVATORIES.

HOUSEHOLDERS and others are now turning their thoughts to the protection of their favourite and choice plants during the winter months, and the care of the tender "cuttings" that they have hopefully taken in preparation for planting out in the spring months of next year. Many houses boast of their greenhouses or conservatories, but the greater proportion of these are next to useless because of the want of proper heating arrangements; and in others, again, there are heating arrangements that have fallen into disrepair and desuetude. In the former case, it is often the initial cost that debars; and in the latter, the trouble inherent to the ordinary system of heating—the lighting of fires and the attention demanded by them—often leads to abandonment where a man cannot afford hired service for the duty. The cost of the installation of a hot-water circulating system is a serious matter for the owner of a small conservatory or greenhouse; and when he sits down and counts the cost of obtaining a comparatively small result, he gives up the notion. To such a one, or to one who finds that attention to an ordinary boiler fire taxes both his inclination and time, gas offers its aid.

A very simple arrangement is the patent "Tubal" greenhouse



Various Arrangements of the "Tubal" Greenhouse Heater.

heater, which the Richmond Gas Stove and Meter Company, Limited, are making, and which we see, by a circular to hand, the Gaslight and Coke Company are letting out on hire. Now in connection with such a heater, there are primary considerations the meeting of which will—if anything will—tend to make the system popular. The installation cost must not be high; it must be possible to instal it with the minimum amount of attack on the structure; it must be economical in use; it must not demand too much attention; it must be effective. All these conditions are fulfilled in the "Tubal" heater. It is on the hot-water-circulating principle; and it can be made either with one length, or be two-sided or three-sided, or, again, double or more lengths can be disposed under one bench of a house. In fact any situation can be negotiated with the arrangement. The illustrations exemplify a few of the methods of fixing up. The construction is simplicity itself. The little burner and heating chamber (atmospheric gas-jets are used) is a box 9¼ in. by 13 in. high on four feet. There are igniting shutters on both sides of the box, so that it does not matter on which side of a house the box is placed; nor is it a matter of concern whether the box is situated inside or outside the house. An air-inlet pipe to the burner box is taken from the outside of the house; and the pipe is carried along the bottom of the chamber—the air-inlet holes being underneath, so that there is no direct draught on to the flames. The hot-water pipe (constructed of strong gauge zinc, and painted) runs from the top of the burner box (on to which it is made to fit correctly), and centrally inside runs the gas-flue pipe, along which the hot products of combustion travel, raising the pipe to a high temperature, and finally passing away outside the house at the farther end of the pipe or system by a flue outlet carried through the wall.

The annular space formed by the tubes is filled with water; and to this the heat of the inner tube is conducted. Around the outside of the inner tube is a fixed projecting spiral; and this is said to assist the circulation of the water. However that may be, it certainly helps in making use of the heat in the inner tube by conveying it through the surrounding water, and presenting to the latter a larger heated surface. At the end of the water-tube, on top, is a small rectangular water-cistern, or expansion tank, with loose lid. It is through a hole in this tank that the annular space in the tubes is filled, but the water is not carried higher than the filling-hole, so as to leave the tank free for its purpose of an expansion chamber. No water connections are necessary, as the arrangement can be filled by a bucket, and evaporation is so slow that the water only requires replenishing occasionally. Carriers are provided for the pipes, so that no brickwork supports are required.

Regarding the gas consumption, a duplex tap is provided enabling the gas to be turned down to half power when required. The patentee states that a gas consumption of 6 cubic feet per hour will maintain the temperature in a 12 feet length of 4-inch pipe at 200° Fahr., when the feed-water is nominally 40° Fahr.

One of the great points about this device is its reliability and the complete obviation of the inconvenience and discomfort on cold winter nights of lighting and banking-up fires. A match, and an eye to the condition of the water in the tubes, and the arrangement can be left without further anxiety; and, moreover, the temperature can be quickly regulated as required. A governor is recommended to deal with varying pressures. Users of the arrangement speak highly of its action, economy, and efficiency. A simple apparatus of this kind has, we can see, possibilities far beyond greenhouses, and such like. It could be used for hot-water circulation in buildings, in cold cellars, shops, and other places where ordinary fires cannot be installed or else would be inconvenient.

Institution of Civil Engineers.—The Inaugural Address of the President of the Institution, Sir Alexander B. W. Kennedy, LL.D., F.R.S., will be delivered on Tuesday, the 6th prox. The Council's awards for papers will also be presented.

The American Gas Institute.—The first annual meeting of this Institute, which, as our readers may remember, is the result of the union of the American, Ohio, and Western Associations, will be held in the Auditorium Hotel, Chicago, from the 17th to the 19th inst., under the presidency of Mr. B. W. Perkins, of Altoona (Pa.).

Use of Alcohol in Manufacture.—There came into operation yesterday an Act lately passed to enable manufacturers to use alcohol in certain of their processes without previously paying duty on the raw material. The measure is regarded as a concession to the long-continued agitation which Mr. Thomas Tyrer, of Stratford, and other manufacturing chemists, have maintained for relief, as against the advantages possessed by foreign competitors. Aniline dye, for instance, is almost entirely made abroad, though it is a British invention. Hitherto the spirit used in its manufacture in this country has been heavily taxed, while in Germany it has escaped the payment of duty; the result being that the Germans can make the dye for less than 6d. per pound, the cost of production in this country being nearly five times this amount. It is only in cases in which no alcohol remains in the finished product that relief will be given; the extent of the reduction being 40 per cent. in the cost of the spirit.

Manufacture of Portland Cement.—Some particulars having been sent for insertion in the Engineering Supplement to "The Times" in regard to what is asserted to be a "wonderful discovery," which will have the effect of throwing out of use all existing methods of manufacturing portland cement, inquiry was made into the matter, and it was found that the "discovery" consists in the utilization of blast-furnace slag. On this subject, a correspondent, whose views may, it is stated, be accepted as authoritative, said: "It has been common knowledge for many years past that portland cement can be made of other materials than chalk or clay; while processes for utilizing blast-furnace slag in the manufacture of cement are constantly being brought forward, but, so far, have met with very little success. In the first place, there is considerable difficulty in getting suitable slags continuously; while in the more recent processes it is even necessary to add a proportion of lime, or, preferably, genuine portland cement, to obtain a cementitious product. The presence of sulphur in the finished product as sulphides is distinctly disadvantageous, as there is a danger of subsequent expansion and disintegration through oxidation of the sulphur compounds. This cement is extremely slow in setting, and is not suitable for work exposed entirely to the air. . . . All cements of this class, and mixtures containing slag, are inferior to artificial portland cement; and no engineer of repute would think of allowing them to be used as a substitute for the genuine article, the all-round usefulness of which has long since been established."

EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.

An Interesting Visit to Tottenham.

Fortunate indeed were the members of the Association last Wednesday, for they were granted fine weather for their visit to Tottenham, and were privileged to inspect works of the greatest possible interest to gas engineers. The Association were the guests throughout the greater part of the day of the Chairman and Directors of the Tottenham and Edmonton Gas Company; and it was the entrance to the historical works at the end of Willoughby Lane that formed the *rendezvous* for the members. There they found awaiting them—the hour was 10 a.m.—the Deputy-Chairman of the Company (Mr. D. Ford Goddard, M.P.), the Engineer (Mr. A. E. Broadberry), the Secretary (Mr. James Randall), the Assistant Engineer (Mr. J. Terrace), the Assistant Secretary (Mr. E. Topley), and the younger members of the staff. Among the company, were the President of the Manchester District Institution of Gas Engineers (Mr. J. H. Brearley), the President of the Southern Association (Mr. F. W. Cross), and the President of the Irish Association (Mr. R. Bruce Anderson).

Greetings were most cordial; and Mr. Goddard, addressing the visitors, welcomed them in the name of the Chairman and Directors of the Tottenham and Edmonton Gas Company. He was very sorry that their Chairman (Mr. Corbet Woodall) was unable to be present; and Mr. Woodall desired him to express his regrets. In his absence, the agreeable duty of representing the Board fell upon him (Mr. Goddard) as the Deputy-Chairman. In going round the works, it would be seen that Mr. Broadberry had had a very severe task to encounter for many years past. He had had to contend with an abnormal growth of consumption, and had had to entirely remodel the works, and make substantial additions. He had really achieved his task most successfully; and he (Mr. Goddard) hoped the members would be satisfied with what they saw.

The members were each supplied with a plan of the works and a pamphlet, the contents of which are worthy of greater circulation than among the ninety or so visitors, on account of their interest. We therefore reproduce them—

A SHORT HISTORY OF THE TOTTENHAM GAS-WORKS.

By A. E. Broadberry, Assoc.M.Inst.C.E., Engineer and Manager.

In 1845, Mr. Alexander Angus Croll, who was at that time Superintendent of the Brick Lane Works of the Chartered Gas Company, obtained a concession from the Imperial Gas Company to supply the districts of Tottenham and Edmonton (which then included Wood Green and Southgate). He procured a site for manufacturing purposes of barely 1½ acres—now the extreme southern end of the works. The site seems to have been chosen because it was then a coal-yard contiguous to the Eastern Counties Railway (now part of the Great Eastern Railway), and had a siding with unloading and storage pits—doubtless very good reasons at the time; but, being cut off from communication with the river by the railway, it restricted the coal supply to that available by rail. This is now rectified by the Company having procured the land on the opposite side as far as the river.

Mr. Croll, as is well known, was a pioneer in the gas industry; and at Tottenham he applied many of his inventions. The retort-settings were of his duplicate type, as described in "King's Treatise"—viz., a setting of direct-fired clay retorts on a stage floor, and a setting of iron retorts below the stage, heated by the waste heat from the setting above. Ammonia was recovered by his system of washing the gas in water acidulated with sulphuric acid, which was subsequently boiled down and the sulphate of ammonia obtained. The original tanks were only quite recently destroyed, having been used for years as water-tanks for coke quenching. The purification of the gas was effected by oxide of iron, the use of which for the purpose was patented by him five years previously. The district having already been supplied from the London side by the Imperial Company, the mains had to be reversed to bring the larger ones near the new source of supply; and it affords an instance of the rapidity with which Mr. Croll worked to note that all was completed in a little over twelve months, although he had much other work in hand at the time.

In the year 1844, Mr. Croll had patented the dry gas-meter, of which he was joint inventor with William Richards; and at the time, he and Mr. Thomas Glover founded the Clerkenwell meter business, under the style of Croll and Glover. The following interesting letter to his partner—found among the papers of the latter in 1903, and presented to the Company by his grandson and namesake, Mr. Thomas Glover—outlines the formation of the Company.

Tottenham and Edmonton Gas-Works,
Pharos Lane, Marsh Lane.

These works stand upon nearly 2 acres of freehold land, are bounded on the south by the Eastern Counties Railway, and on the west and north by Willoughby and Dyson's Lanes.

They consist of a retort-house—50 feet long by 40 feet broad, side walls 19 feet high—capable of containing 60 retorts.

There are at present erected ovens for 40 retorts, one-half of which are filled, and in working order.

Coal-store, within 20 yards of the railway, capable of containing a winter's stock, with gas-fitter's shop attached.

Purifying-house, containing two sets of double purifiers, two saturators, an exhauster, and 2-horse steam-engine.

Lime-room likewise containing the steam-boiler.

Ammonia-room, with the necessary apparatus for making sulphate of ammonia.

Store-room and blacksmith's shop.

Two gasholders, each 32 feet diameter by 17 feet deep, set in cast-iron tanks.

Condenser.

Tar-well, sufficient to hold six months' stock.

Two-stall stable and coach-house, with hay-loft above.

Bath-room with cold and warm baths and necessary fittings.

Greenhouse, stocked with plants.

Superintendent's residence, consisting of a two storey four-roomed house, with kitchen and other offices.

Counting-house of two large rooms, with water-closet attached.

Main pipes—

3310	yards of	2	inches diameter
5615	,,	3	,,
36	,,	4	,,
153	,,	5	,,
5032	,,	6	,,
1016	,,	7	,,
2030	,,	Service-pipe.	

Making a total of nearly 10 miles in length.

The above are at present the property and in possession of A. A. Croll, by whom they were erected, and intended by him as a permanent investment, and were on that account built of the best materials, in the most substantial manner, and in strict accordance with the Building Act.

There are two main pipes leaving the works—one proceeding along Willoughby and Marsh Lanes, the other going up Dyson and Water Lanes.

A direct communication between the united villages of Tottenham and Edmonton could have been formed by going up Waggon-and-Horses Lane, and at one-third the expense; but the route taken was considered best from the fact that it thus embraced the coach road leading to the two stations of the Railway—Marsh Lane and Edmonton, both of which will, in all probability, be built upon in a short time.

The works are supplied by an artesian spring, which flows to a height of 8 feet, and is carried in pipes all over the works, so that no manual labour in pumping is required.

The whole of the spare land is in a good state of cultivation, and tastefully laid out in grass lawns, flower plots, and gardens, to be appropriated to the further extensions of the works. A beautiful fountain and pond stand opposite the Superintendent's house, and fronting the gate of the works. This is supplied with a constant stream of water from the artesian spring.

It is proposed to form a Company for the purchase and carrying on of the above works, with a nominal capital of £20,000, in 1000 shares of £20 each—100 of such shares to be reserved to A. A. Croll.

The Company to pay to A. A. Croll, on their taking possession of the works, the sum of ; the remainder of the purchase money to depend upon the amount of profit realized during the first twelve months of the Company's proceedings, and to be calculated upon the following principle—viz.,

The whole of the expenditure included in the following items: Coals, wages, salaries, lime, wear and tear of retorts, taxes, general expenses, ½ per cent. for bad debts, acid, deterioration fund 1 per cent., gas-fittings purchased.

The above to be deducted from the gross income by: Gas, coke, breeze, tar, ammonia, gas-fittings sold, old materials. And for every £60 of profit shown by the balancing of these accounts, the Company to pay to A. A. Croll the sum of £1000; or, in other words, the Company shall have secured to them 6 per cent. upon the amount to be paid for the works.

If this amount is secured to the Company for the first year, it is fair to presume that it will go on increasing every year for two reasons—the villages of Tottenham and Edmonton previous to the erection of these works were never properly attended to as to lighting, and, in consequence, there is a general desire for gas, including the private dwellings of the most respectable inhabitants; and, as the works are sufficiently large to allow a double extension of the present demand, no investment will be required for a considerable length of time.

The Company was successfully started with a nominal share capital of £25,000; the deed of settlement being dated the 21st of December, 1847.

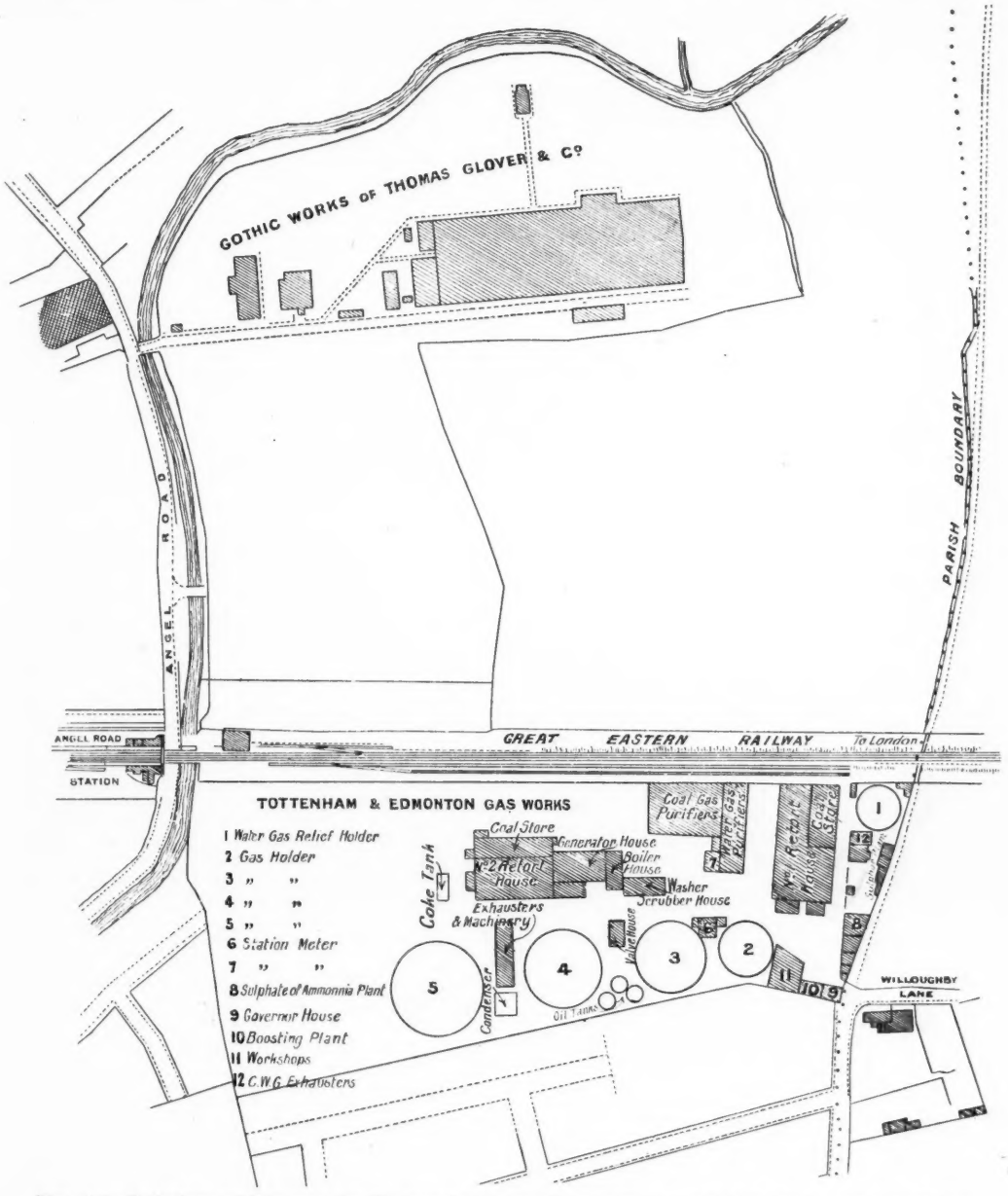
Mr. Croll appointed Mr. George Anderson as Manager of the Tottenham works; and he gladly accepted the post, small as it was, as it gave the opportunity of adding scientific experiment to the practical knowledge he already possessed. It may almost be said that during the few months Mr. Anderson remained at

Tottenham, he laid the foundation of his very successful career. Mr. Croll's indefatigable enterprise, however, started him on to the formation of the Great Central Gas Consumers' Company, to supply cheap gas (at 4s. per 1000 cubic feet) to London, in competition with the other existing Companies, whose price was 6s.; and Mr. Anderson went to assist him there, subsequently setting up on his own account, resulting in the founding of many gas-works on the Continent and in Ireland. Tottenham was thus left without an Engineer; the foreman being held responsible for the conduct of the works, and the Secretary, Mr. James Watson Duke, for the business part.

In 1851, Mr. Jas. Randall, my esteemed colleague, entered the service of the Company, and performed all the various duties a lad would be called upon to perform in a small works. He acquired practical knowledge, and gradually became entrusted with more and more important duties, until in May, 1857, he was appointed Secretary, which position—now a very onerous and important one—he still worthily fills.

In the year 1856, Mr. David Barclay, who had a business as plumber and gas-fitter in Tottenham, and who (besides being a large shareholder) carried out a great deal of district work for the Company with considerable ability and zeal, was appointed Engineer and Manager, and retained the office until his death in 1874.

The Company continued its existence as a non-statutory one until Aug. 1, 1859, when Royal Assent was given to their first Act. The maximum price of gas was fixed at 6s.; and the illuminating power at 11 candles. Hornsey was included in the limits of supply, although the Hornsey Gas Company, Limited, was founded two years before; but Enfield, which was part of the



Plan of the Tottenham and Edmonton Gas-Works and of Messrs. Thomas Glover and Co.'s Gas Meter and Stove Works.

original Company's ambition, was not scheduled. The powers in Hornsey were not exercised; and in 1866, the Hornsey Company also obtained powers of supply, but it was not until 1884 that our powers in Hornsey were repealed.

About the year 1858, another Gas Company came into existence—called the Southgate and Colney Hatch Gas Company, Limited; and works were erected in a far corner of our area. In 1865, the more distant half of Southgate was surrendered to the new Company by agreement, ratified by Parliament in 1866; but it was not until 1904 that the Tottenham Company's powers were cancelled. At that early period, probably from lack of funds, the policy of the Company seems to have been to get rid of all the outlying districts where gas was wanted; and the Enfield Company had their share—an indefinitely described area in Southgate and Edmonton being allowed inclusion in their Act of Parliament. It was not till the year 1898 that a definite boundary was agreed; and the Tottenham Company were relieved of their powers and obligations.

That period of the early sixties appears to have been the "dark hour" of the Tottenham Company, concerning which Mr. Randall can tell many a harrowing tale of woe. But the sun of success then began to dawn; and it has since been continuously rising towards its zenith, which, however, yet appears to be far away in the distant and unknown future.

In 1874, on the death of Mr. David Barclay, my late father (Mr. W. H. H. Broadberry) was successful out of 43 candidates in gaining the appointment of Engineer and Manager. One of his first duties was to commence remodelling and re-piping the works; and while he continued at the helm, from 1874 to 1899, the output grew between six and sevenfold—viz., from 91,507,000 to 575,658,000 per annum. He lived not only to see his original remodelling in its turn become too small and confused with

constant additions, but to start once more on a fresh scheme of reconstruction devised to be adequate to the final possibilities of the whole site. It was, however, a promised land that he might only view from afar; and at his death in 1899 the Directors entrusted to me the carrying on of the good work.

In the reconstruction and general business of the Company, I have had the gratifying encouragement, help, and support of my Board. Fortunate indeed have I been in having two technical Directors as Chairman and Vice-Chairman; and the practical knowledge, technical skill, and administrative ability of Mr. Corbet Woodall and Mr. D. Ford Goddard—respectively Chairman and Vice-Chairman—have been especially beneficial. I take this opportunity also of testifying and acknowledging the help and willing assistance I have received from the whole staff in the trying work of alteration—particularly from my Chief Assistant, Mr. John Terrace, and my old friend the General Foreman, Mr. W. A. Dean, whose 25 years' service with the Company has made him ever more and more enthusiastic in its cause.

The area of the present works is 15½ acres. The new manufacturing area of 31½ acres is on the opposite side of the railway extending to the River Lea; and some additional spare land, to the extent of 48½ acres, has also been acquired. The High Road site for office and depôt, opened in 1901, covers more than 1 acre; and the Wood Green site, opened 1883, ¼ acre.

The growth of the output since I received the chief control in 1899 has been from 575,658,000 to 1,142,854,000 cubic feet, and clear indications show that this year an additional output of at least 115,000,000 feet will be required.

The present producing plant consists of—

No. 1 Retort-House, containing 24 beds of eights, 22 in. by 16 in. through retorts, with regenerative heating—total 192 retorts. Eighteen of the settings (144 retorts) are drawn and charged by Arrol-Foulis machinery, and the coke is removed by a De Brouwer hot-coke conveyor. The remaining six beds are hand-stoked. The total capacity of the house is 2,400,000 feet per diem.

No. 2 Retort-House, containing at present twelve beds of tens, 21 in. by 15 in. through Ω retorts, with regenerative heating. The charging and discharging is effected by De Brouwer's projector and pusher. The coke arrangements are similar to No. 1 House. The other side of the building, now used as a coal-store, is intended for a similar bench of retorts, when the total capacity of the house will be 3,750,000 feet per day.

The Water-Gas Plant, which was first put in operation in 1894, when Beckton was the only other works in England using the system. It now consists of—

Two Sets,	375,000 feet each =	750,000	cubic feet.
Two Sets,	500,000 ,, ,, =	1,000,000	,,
Two Sets,	1,000,000 ,, ,, =	2,000,000	,,

Or a total of 3¾ millions per day.

The remainder of the plant is proportionate, and consists of modern and well-known arrangements.

THE INSPECTION OF THE WORKS.

The works are now so extensive, and the scheme of reorganization and extension that has been proceeding from Mr. Broadberry's plans for several years past so great, that it would be absolutely impossible to explain all that deserve treatment within reasonable limits as part of the present report. But there is no need to attempt description here, as in the first two numbers of the "JOURNAL" for December, 1903, the early sections of the scheme were fully described; and in our issue as recently as Feb. 13 last an illustrated description of the more recent extensions—including the fine new retort-house—was published. From these articles, a considerable amount of detailed information can be procured. Having first inspected the new governor room, the visitors took a turn round the old part of the works, along the railway sidings and into the old retort-houses, which are as dissimilar from the modern erection on the other side of the works, both in structure and equipment, as retort-houses can be. The old ones are representative of what is beginning to be recognized as the old order of things. The excellently equipped workshops were visited; and some of the members present tried to peep into the future to see if this was the beginning of the Tottenham Company becoming their own plant-builders. Who knows? Many strange things have happened during the last quarter of a century in gas-works; and Tottenham offers examples that would have raised a smile if predicted when that quarter of a century was young.

View of Messrs. Thomas Glover and Co.'s "Gothic Works," as taken from the Top of the Tottenham Gas Company's Holder.

A NOVEL METHOD OF PUMPING SYPHONS.

From the workshops (which by the way are lighted by the Sale and Onslow system, with 1000-candle power burners), the visitors were assembled round an arrangement of novel apparatus for which Mr. Broadberry gave full credit to his Chief Assistant, Mr. John Terrace. It has been devised to obviate the inconvenience of taking a syphon-cart (with its resultant mess) about the yard, and consists of a simple and effective means of emptying the syphons. The apparatus comprises a cylindrical tank fitted with a Körting's steam-ejector, and connected by means of 1¼-inch pipes to the syphons in various parts of the works. On p. 29 we show the system diagrammatically, so that a better idea of the working may be gained. Steam is first of all admitted to the ejector, so as to secure a vacuum in the receiving cylinder of about 20 lbs.; and the man whose duty it is to empty the syphons then proceeds to where the syphon is situated. He unscrews the bayonet cap of the indicator-pipe; and the absence of any escaping gas shows that the syphon contains liquor. He then opens the cock at that particular syphon, and keeps it open until gas blows at the indicator-pipe, when he closes the cock and replaces the cap. The indicator-pipe being about 1-inch shorter than the suction-pipe gives the man time to close the cock before any gas has been sucked up into the receiving-tank. He then proceeds to the next syphon, and so on; the time necessary to empty each syphon being about a minute. When all the syphons have been attended to, he returns to the receiver, opens the cock B, and closes the cocks A and C, when steam is admitted to the receiver, and forces its contents out through the run-off to the tar-tank. The apparatus was first tried on a syphon on a long main between No. 1 retort-house and the condenser. The liquor was hot, and consisted largely of tar; the total lift being about 12 feet. This was quite satisfactory; and the system is now applied to nearly all the syphons on the works, and the others are being connected up.

THE NEW SECTION OF THE WORKS.

From here the new section of the works was visited, the "boosting" arrangements were examined; the new machinery house, containing the electrical machinery for the new De Brouwer projectors and dischargers, and the De Lavel turbines, coupled to dynamos, were inspected; and then the magnificent exhauster

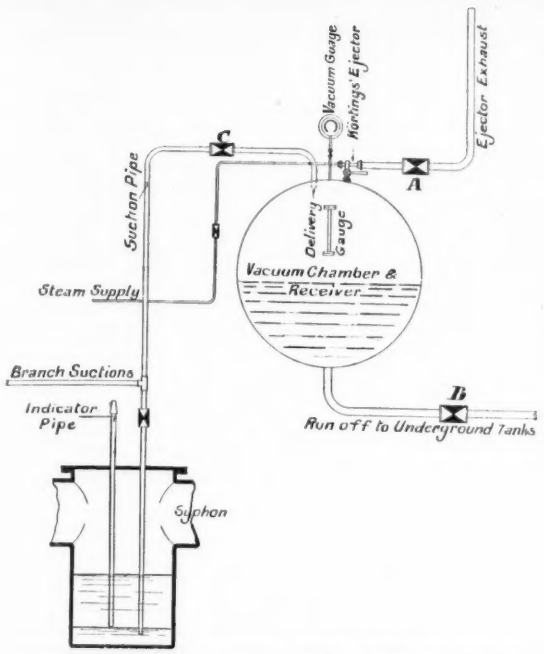


Diagram showing Mr. J. Terrace's Method of Pumping Syphons.

house claimed attention. The large carburetted water-gas sets of Messrs. Humphreys and Glasgow were examined; and the system of conveying coke from the retort-house by gravity bucket conveyors to the generators was observed. But most time was spent on the stage of the new retort-house, watching the action of the De Brouwer plant, which was supplied by Messrs. W. J. Jenkins and Co. The retort-settings—ten retorts in a bed—by the way were by the West Gas Improvement Company; and the coal and coke handling plant was by Messrs. Graham, Morton, and Co. Dr. Colman's cyclone tar-separator was an object of curiosity; and the system of conveying the coke outside to the overhead coke bunkers was also investigated by many of the visitors, as were the tipping arrangements for the coal-waggons, and the elevating plant. Upon all these points details have been published, and can easily be referred to.

The New Offices and Stove Repairing Shops.

Here commenced sight-seeing farther afield. Brakes were at the works by the appointed time; and from the works the visitors were conveyed to the splendid offices and stove repairing shops in the High Road, Tottenham, which are additions of recent times. On the way, although it was daylight, a demonstration was made of Dr. Rostin's system of lighting and extinguishing the gas-lamps by increasing the pressure at the gas-works. It is understood that, so successful is the system, that some 1200 lamps in the Company's district are already fitted with the arrangement. Coming to the offices and stove repairing shops, they occupy a fine central position, and architecturally are a credit to the neighbourhood. The stove-repairing shops (which are situated at the rear of the offices) were the object of the curiosity of the visiting gas engineers; and they critically inquired into all that was to be seen, in the plant and operations, which were pronounced by all as being excellent in both design and method. All stoves returned from hire are cleaned and renovated here. The shops consist of four large and airy inter-communicating rooms, all opening on to a raised platform for the convenient receiving and despatching of goods. In the first is situated the roasting, "barffing," enamelling ovens, and blacksmiths hearths. Here the stoves, after having the fittings removed, are placed in an oven heated by means of flues; and when they are released, all grease and dirt is easily cleaned off by means of a wire brush. Much interest was evinced in some samples of "barffing" which were shown. It was explained that the specimens (which consisted of oven shelves, gas-fire frets, boiling-rings, &c.) were placed in one of the ovens and kept at a dull red heat; steam being admitted at the same time. After about half an hour, the goods were taken out—the process being then complete. One specimen (an oven shelf) shown had been hanging out in the open since April in rain and sunshine, and presented no signs of rust anywhere. In the adjoining room, men were busily engaged in fitting up and taking to pieces, polishing the bright parts on special wheels ranged along one side, and doing all the necessary work consequent on renovating a gas-cooker or gas-fire. The next room was fitted up with racks, containing all the necessary spare parts, and the next contained finished cookers ready for removal to consumers' houses.

Mr. Randall then took charge of the visitors, and conducted them through the offices and show-rooms which have been designed with a special view to the purposes they have to serve. There is something in making a good impression upon customers; and these offices have about them an air of prosperity which is not belied by fact. The decoration and the finish are good, and handsome in their excellence, without gorgeous display.

To Chingford and a Luncheon.

Remounting the brakes, the party had a very enjoyable drive to the Forest Hotel, Chingford. *En route*, they were given, at the beginning, an excellent impression of the characteristics of the district which make it such a fertile place for the development of gas consumption; and leaving the populated part of the area for the more rural outskirts, immense pleasure was derived in passing through open country which was new to many of the visitors. Arriving at the Forest Hotel, they were entertained, with liberal hand, at luncheon by the Chairman and Directors of the Tottenham and Edmonton Gas Company. In the absence of Mr. Corbet Woodall, Mr. D. Ford Goddard, M.P., the Deputy-Chairman, presided, having on his right-hand side the outgoing President (Mr. R. G. Shadbolt, of Grantham), and on his left the President-Elect (Mr. E. J. Brockway, of Cleethorpes). Mr. Broadberry and Mr. Randall were also at the head of the table. After the morning's outing, full justice was done to the luncheon.

Subsequently, the Chairman submitted the toast of "His Majesty the King;" and it was very heartily honoured.

Then Mr. James Randall proposed "Success to the Eastern Counties Gas Managers' Association." Though all present knew of the long record of his service to the Tottenham and Edmonton Gas Company, no one could dispute, after seeing his activity throughout the visit to the works and offices, his assertion that he felt then more juvenile than when he started that morning. He spoke of the usefulness of such Associations as the Eastern Counties, and referred to the days having gone by when gas-works' gates were closed against visitors. He was pleased to find all that kind of thing reversed. His Chairman and Directors, he knew, were highly delighted to have the members at the works that day, and to receive them as their guests.

Response was made by Mr. Shadbolt. He remarked that he believed the intention of the toast was that the future might hold in store for the Association a greater success and sphere of usefulness than in the past. But the success of the Association as now exemplified was more than was ever dreamed of by those who founded the Association a great many years ago, and some of whom, he was happy to say, were still with them. The Association since it was established had made very great progress. It had adapted itself to its environment; and he thought he might claim that it had done equally as well as the other District Associations. So long as they had men in their midst like Mr. Broadberry, so long as they could work with the countenance of such gentlemen as their Chairman and his colleagues, so long would they continue to do good and useful work. Concluding, he said, "Long may we live as an Association; and as our days increase, so may our usefulness."

The toast of the "Tottenham and Edmonton Gaslight and Coke Company" was in the hands of Mr. Brockway; and he observed that, after their visit to the works that morning, and after their acquaintance with the Deputy-Chairman, the Engineer, and the Secretary, the suggestion of success seemed almost superfluous. The members had that day received at the works an education in gas manufacture and in the latest methods of operation which they could not fail to carry away and retain, to the end that they would make use of some of the ideas in later days, when they had improvements and extensions to carry out, to the ultimate success of their individual undertakings. He was sure one and all appreciated very highly the invitation and the right royal reception accorded them. He coupled with the toast the names of the Deputy-Chairman and the Engineer of the Company.

The Value of the Expert Director.

In the course of his remarks in reply, Mr. Ford Goddard said the Director of a Gas Company took a small part in these days; he was one of the "necessary evils" that a gas manager had to put up with. ["No," and laughter.] Therefore the members would understand him when he left the burden of reply to Mr. Broadberry, who occupied the far more important and responsible position of Engineer and Manager of their works. The only thing that saved him (Mr. Goddard) on this occasion in speaking as a Director was the fact that he had been a Manager of a gas-works himself. In this regard, he was able to understand a little more of the feelings of those who had the active responsibility of large undertakings like that of the Tottenham Company. The Directors were very pleased to see the Association there that day. They felt that Associations of the kind made for progress and the increase of knowledge in their great industry, which was always growing. If he had ventured to once call himself a Manager, he was perfectly sure he would now be unworthy to do anything more than take charge of a very small works. So large had been the development, that a man who had the responsibility of a works twenty years ago (which was about the time when he had relinquished office) would now feel himself in the rear in the knowledge of gas manufacture. However, he had followed with the deepest interest the progress of the Tottenham undertaking; and he knew something of the responsibility and anxiety that their Engineer had had. Perhaps it was well that among directors of gas companies there should be those who knew, from personal experience, something of the difficulties of their officials. In this connection, he must say how sorry he was that Mr. Corbet Woodall could not be present on this occasion; for nothing would

have given him greater pleasure. Mr. Woodall was himself once a Manager; and he had kept himself abreast of all modern gas engineering progress. It was felt by the Directors that, in showing the members of the Association the Tottenham works, they were not showing them an undertaking that was lagging behind; and he was sure their officers felt they had Directors who gave them all the help possible in preventing any lagging.

Response was also made by Mr. Broadberry; and following on the point raised by Mr. Goddard, he said he did not agree that Directors were "necessary evils," for he found them to be very necessary without any of the "evils" attaching. Members of the profession had asked him how he felt in having two expert engineers on the Board. His reply was that, if they could get on a Board such expert Directors as Mr. Corbet Woodall and Mr. Goddard, then get them. [Applause.] Mr. Brockway had said the visit to the works had been instructive; and that gave him the opportunity of saying that he should not have had the privilege of making the works what they were without the help and encouragement of Mr. Woodall and Mr. Goddard. He had also felt himself bound to keep absolutely up-to-date—to keep himself posted in the developments of the industry because he had such men above him to whom he was responsible. With their assistance, he had tried to make the works one of the best in the country. The members of the Association had been pleased to express their satisfaction with what they had seen earlier that day. He was grateful to them for their expressions of opinion. At Tottenham, he knew he had had exceptional opportunities, because Tottenham was in that particular zone round London where development was bound to take place, and where the Gas Company were certain to have a great increase in consumption. Notwithstanding that during the last few years incandescent burners had been adopted throughout the district, the Company had been having increases over the last seven years, averaging about 12 per cent. per annum. It was a big increase to deal with, especially as they were tearing the old works to pieces and remodelling them at the same time. But the whole of his staff had worked with him; and they had got through the work without a hitch. The district was exceptional in having a very small consumption per consumer. Their consumption per consumer averaged about 27,000 cubic feet per annum; and it was lower than any other Suburban Company—Lea Bridge perhaps was slightly less. Notwithstanding this, and the disadvantage of having to receive their coal by rail, and get rid of the residuals in the same way, the price of gas was down to 2s. 8d. per 1000 cubic feet. This showed the wisdom of the Directors in making the works what they were—orderly and efficient for the work they had to do. The buildings looked rather expensive. But his experience was that money, discreetly spent, was not lost in that way. Buildings that were good and substantial, and were given an orderly appearance, cost far less to keep in order afterwards. (Hear, hear.)

THE BUSINESS MEETING.

In another room in the hotel, the business meeting was held—the RETIRING PRESIDENT (Mr. R. G. Shadbolt) occupying the chair.

The HON. SECRETARY (Mr. T. A. Guyatt, of Ely) read the minutes of the last general meeting held at Grantham on April 25, and they were confirmed.

Mr. J. DAVIS (Gravesend) said, arising out of the minutes, he should like, as he had not an opportunity at the last meeting, to thank the members for having elected him to the office of Vice-President. He should do the best he could to enhance the best interests of the Association.

THE BENEVOLENT FUND OF THE INSTITUTION.

The PRESIDENT said the Secretary had received a letter from the Institution of Gas Engineers which he thought ought to be read.

The HON. SECRETARY read the communication, which was dated June 28, as follows:—

Dear Sir,—It was resolved, at the annual general meeting of the contributors to the Benevolent Fund held on the 20th inst., that a communication should be addressed to the District Associations, asking them to kindly consider the suggestion that each Association should take some special steps, with a view of increasing the list of subscribers to the fund.

Last year the ordinary receipts fell short of the necessary expenditure by £16; so that the fund is really in need of further help.

Great good has already been accomplished by its means; and the Committee are anxious to maintain the value of the grants which they have hitherto been enabled to administer, but the number of applicants for assistance is increasing.

May I therefore, on behalf of the Committee, ask you to be so good as to lay the matter before your members, which it is trusted may result in a good list of additional subscribers being got together from the Eastern Counties Gas Managers' Association.—I remain, &c.,

WALTER T. DUNN,

Hon. Secretary, Benevolent Fund, Institution of Gas Engineers.

The PRESIDENT said the Committee had had the letter under consideration. They thought it a matter that scarcely called for any recommendation from them; and they preferred to leave it to the members generally. He believed a copy of the letter had been sent to the other District Associations; but he was not acquainted with the result—as to whether any of them had made any response to the request. It appeared to him, on the face of it, that the proposal, in the case of the District Associations affiliated with the Institution, was something like a double tax on the members—if they were expected to contribute as members of the Institution and then as members of a District Association. Whether the members of the Association who were members of the Institution were contributing their just quota to the Benevolent Fund was another matter, and one the Committee had not ventured to analyze.

Mr. THOMAS GLOVER (Norwich) said he should like to make it clear that it was not intended to ask members to contribute double subscriptions to the Benevolent Fund. The idea was, perhaps, to induce members to increase their subscriptions, but more particularly to get gentlemen to subscribe who were not already subscribers. It was thought the list could be better extended by appealing through the District Associations than direct from the Institution.

The PRESIDENT thanked Mr. Glover for his remarks. The idea seemed to be that they should endeavour to persuade the members not already subscribers to the fund to subscribe individually. That was as far as they could go at the present time; but the Hon. Secretary would be glad to forward to the Institution any subscriptions that were sent to him for the purpose by members.

MEMBERSHIP ADDITIONS.

The following were next elected to membership:—

Members.—Mr. FRANK PINDER, Loddon, proposed by Mr. H. Wimhurst, seconded by Mr. J. W. Auchterlonie.
Mr. W. CHAPMAN, of Royston, proposed by Mr. J. Davis, seconded by Mr. C. F. Ruggles.

Associate Member.—Mr. GEORGE BAINES, of Harwich, proposed by Mr. F. Paternoster, seconded by Mr. H. Wimhurst.

DISTRICT MEMBER OF THE COUNCIL OF THE INSTITUTION.

The PRESIDENT said the next business was the election of the district member to the Council of the Institution. Possibly, in this connection, some little explanation was due to the members. It might be in their recollection that they were good enough to elect him (the President) as their district representative on the Council of the Institution of Gas Engineers. When the balloting-list for the ordinary members of the Council appeared, he, being one of the nominees, obtained a seat as an ordinary member, and therefore resigned as the district representative of the Association. The Committee thereupon, acting on behalf of the members of the Association, appointed the President-Elect—in this way avoiding confusion and maintaining the representation of the Association.

Moved by Mr. J. H. BREARLEY (Longwood), seconded by Mr. C. F. RUGGLES, a resolution was passed confirming the action of the Committee.

The PRESIDENT said that, to serve from June next and onwards for twelve months, he had great pleasure in proposing that Mr. Brockway be asked to continue as district member of the Association on the Council.

Mr. DAVIS seconded the motion, which was unanimously agreed to.

THE RETIRING AND THE NEW PRESIDENTS.

The PRESIDENT said he had arrived at the end of his term of office as their President. He must thank the members most heartily for the support they had given him during his presidential year, and ask them to continue that support—he would say in greater degree if it were possible—to his successor, Mr. E. J. Brockway, of Cleethorpes, whom he had now the honour of introducing to the members as their President.

Mr. BROCKWAY took the President's chair amid applause.

The PRESIDENT said that before he did anything in his new capacity he ought, as a matter of duty and courtesy, to ask the members to accord to the late President their hearty thanks for the manner in which he had carried out the duties of President during the past twelve months. Nothing was needed to commend this resolution. As a man, they all knew Mr. Shadbolt. He was one whom it was always a pleasure to meet, and whose company one always thoroughly enjoyed. As an engineer, they knew him as one of the most forward in the profession, one who was most up-to-date, and one who had ever endeavoured (when opportunity permitted) to carry out investigation into any new process that presented itself, who had, in fact, been a pioneer in the profession. It seemed to him (the President) there was only one word that would express what they felt—that, as a President, Mr. Shadbolt had been ideal. He therefore asked the members to accord to him, in the heartiest possible manner, a vote of thanks for the way in which he had carried out the duties of President during the past year.

Mr. J. W. AUCHTERLONIE (Cambridge) seconded the motion, which was passed with great cordiality.

Mr. SHADBOLT, in reply, said if there was one thing which could console him upon having to resign the presidency of the Association, it was the expressions of appreciation that had fallen from the lips of the new President and Mr. Auchterlonie, and their ratification by the members generally. He could assure the members that it had been a work of love on his part; it had been an occupation in which he had delighted. He was naturally pleased at the end of his term of office that his efforts, short as

they had come of the ideal, had at any rate been appreciated. He had done the best that within him lay; and he thanked the members heartily for their appreciation of the little that he had accomplished.

Mr. Brockway then read the following

INAUGURAL ADDRESS.

Owing to the varied and exceptionally interesting programme of to-day, I find the time at my disposal to be somewhat limited; therefore what I have to say in the way of a Presidential Address must necessarily be concentrated and condensed—indeed, I can scarcely attempt to give you an address worthy of being called an inaugural address, and must be content with touching lightly upon a few of the topics connected with our profession. My first duty is to ask you to accept my sincere and hearty thanks for having selected me to preside over the Association for the ensuing year. I assure you I feel deeply sensible of, and appreciate very highly, the honour thus conferred upon me. This is the eighteenth anniversary of the Association. Our first meeting was held on Sept. 26, 1888; our numbers being 25. Eight only of those are still members. Some have passed away, and others have for various reasons dropped out. But our Association has grown and prospered; and we have to-day a total membership, including associate members, of 95. In numbers and financially our Association has grown year by year; gaining in energy and importance, and in the cultivation of that mutual assistance and friendship which is so helpful both individually and collectively.

Trial Experiences with the Settle-Padfield System.

During the past year, since our meeting at Cleethorpes, there have been no startling developments, either in the manufacture or use of gas; but I believe it can be said that we have made steady and continuous progress all round. While there has been no really radical change in the process of gas manufacture, interest has been, and is being, taken in new methods of drawing and charging; and there has also been a considerable amount of investigation work carried on, having for its object improvements on our present carbonizing methods. One process that has attracted a considerable amount of attention is the vertical retort. It will be remembered that at the time of the visit of the Association to Cleethorpes a year ago, we were erecting a setting of six retorts on the Settle-Padfield system; and I have been told that, whatever else I left unsaid, some statements and particulars would be expected from me to-day as to their working. Well, I am sorry that the information I have to give you is not altogether of the most encouraging nature. I was led to adopt this system after seeing the model at the Earl's Court Gas Exhibition, and reading the published results stated to have been obtained at Exeter.

The method of carbonizing coal by introducing very small charges at short intervals appeared to me to be ideal, and as offering great possibilities compared with carbonizing coal in bulk; also the small amount of labour required, and the ease with which it seemed possible to work the plant, were strong inducements. We, therefore, determined that if the results published could only be maintained, we would try the plant at Cleethorpes. Unfortunately, the Exeter installation, for various reasons, had to be abandoned; and we were thus unable to judge, from long continued running, whether the first results could be maintained, as no vertical retort plant on this system was working at any other place. However, we eventually decided that, subject to satisfactory guarantees, we would have an installation put in. After long negotiations, we finally entered into a contract with the Self-Charging Vertical Gas-Retort Company, Limited, to put up at our works an experimental installation, consisting of six vertical retorts in one bench, of similar size, and worked in the same way, with similar apparatus, as the Exeter bench. The essence of our contract with the Syndicate was that they worked the plant, after completion, for four months, and guaranteed to manufacture regularly 13,000 cubic feet of 15-candle gas per ton of coal, and that the fuel used in heating the retorts should not exceed 15 per cent. of the coke made.

Small coal being required for the Settle-Padfield process, we fixed a plate in the bottom of the coal-conveyor in our horizontal retort-house, with perforations of such size and centres as we considered best to take out small coal suitable for the vertical retorts. This coal was fed into an elevator, which discharges it into an overhead hopper, whence the coal is distributed to the six hoppers, fixed over the top mouthpieces, through which these plungers deliver coal into the retorts in regular quantities at regular periods. The cast-iron plunger cones are screwed on to 1½-inch diameter rods; and the space between the top and the bottom cone can thus be adjusted within the limits of the cylinder —say, from about 2 lbs. to 7 lbs. of coal per charge—in which the plunger works. The method of driving the eccentric shaft from which the plungers are worked is also arranged so that a variation can be made in the drive of from one stroke of the plungers in 3½ minutes to one stroke in 20 minutes; or, in other words, the variation can be made of from 2-lb. to 7-lb. charges to each retort in 3½ to 20 minutes. The usual charge, however, is intended to be (say) 7 lbs. in 5 minutes; and the eccentrics are so set that the feed will be as nearly as possible continuous—that is, while in some of the retorts the plungers are going back for a fresh charge, in the other retorts the plungers are delivering the coal, so that there shall be no sudden rushes of gas through the foul main.

The setting is heated on a system of tubular regenerator, which is placed below ground, with a cellar for clinkering as used for horizontals. The combustion chambers are two in number, running parallel with the furnace, each combustion chamber serving the two outer retorts and half of the two inner retorts. The gases pass from the combustion chamber all round the six retorts, being baffled by stay-walls, placed in suitable positions, perforated to allow of the travel of the gases, and pass through against the pier wall, dropping down into the tubes and away to the main flue; the outlet being regulated by means of dampers in suitable positions.

Abandoning Carbonization in Small Quantities.

After working the apparatus in various ways, I was very disappointed to find that it was not practicable to fully carbonize the coal when charged into the retorts in pinches, unless left in for several hours after the retort was full. The most suitable method of working we found was to fill the retorts with coal by means of the plungers as quickly as possible; and then let the coal remain in the retorts for a period sufficient to fully carbonize it, when all but a small portion of the coke was drawn out and the process repeated. For working the retorts in this manner, we found it to be an improvement to do away with the plungers altogether, and fill the retorts direct from the measuring chamber by means of a shoot; the measuring chamber taking its supply from an overhead hopper. The retorts were thus charged much more quickly; the plungers, with the cumbersome machinery for operating them, were dispensed with; and, incidentally, the wear and tear was considerably reduced. As far as we have gone up to now, without returning the tar, we obtain up to 12,000 cubic feet per ton of coal, which, it will be observed, does not come up to the guaranteed make, and have had as much as 36,000 cubic feet per day from the six retorts.

Our principal difficulty, however, in connection with the plunger method of feeding, was the jamming of the plungers and the formation of lamp-black in the foul main, which always took place after emptying the retorts. The remedy for this we found to be in keeping the retorts always partially filled; the lamp-black only forming when small portions of coal were put into empty retorts. The coal also has a tendency to hang to the sides, and around the plungers and the retort, and not fill the whole of the area of the retort. The coke, too, adheres to the retort sides, causing much difficulty in getting it out; there being no proper means of reaching the coke stuck in the upper end of the retorts. To my mind, a straight up and down retort, with a good taper, is a great improvement; and, judging from the results recently published, it is to vertical retorts arranged in this way that we must look, if they are to be developed and perfected and compete with, or supersede, our present method of carbonizing with horizontals or inclines.

The Dessau Vertical System at Mariendorf.

Recently I visited the Settle-Padfield bench at Rotterdam, and also one erected at the new Tegel Gas-Works, at Berlin. Both settings had been worked; but at the time of my visit they were cooled down and out of action—difficulties having been experienced more or less similar to our own. I also visited the Mariendorf Gas-works at Berlin, and inspected the settings on the Dessau system, and was received most courteously by the Chief Engineer, Herr Körting, who took me through himself, and had the retorts opened out and drawn and charged in my presence. In this system, there is no mechanical apparatus beyond the elevators. The retorts are filled at one operation; each retort taking about half-a-ton of coal, which remains in about twelve hours, and is then emptied and the retorts re-filled. The retorts are heated to a very high temperatnre in the lower part, cooling off at the top. The system is most simple and the work so light that the labour charges and maintenance must be very low.

This is just a brief *resumé* of my experience with verticals; and while I admit that they are not of the most encouraging nature, I have every confidence that, with the experience already gained, and the experiments and trials which are still going on, vertical retorts will become in the near future keen competitors with horizontals and "slopers" and the present methods of carbonizing generally.

Combining Dellwik Water Gas and Coal Gas.

The old saying that dividends are made in the retort-house may not be quite so applicable to-day as it was when first stated, but economy in the cost of production is undoubtedly the chief problem at the present time, and one that occupies our minds most. Coupled with this is the question of what has been termed high *versus* low grade gas. I have had experience in supplying both; and now, after nearly three years' working with what may be termed low-grade gas, we have for some considerable time been supplying a gas 14½ candle illuminating power, and a calorific value of from 540 to 550 B.Th.U. net. This, while giving complete satisfaction to our consumers, has enabled us to considerably reduce the price and (working under the sliding scale) pay higher dividends to our stockholders. The gas, as most of you I believe know, is a combination of the Dellwik blue water gas and coal gas; and after upwards of three years' working, I can unhesitatingly say that this mixture has proved in every

respect thoroughly satisfactory, both to the consumers and shareholders, while to the Manager the simplicity of production and flexibility and range of working add greatly to his peace of mind, both as regards maintenance of supply to customers and dividends to shareholders. The one point to be particular about is that at all times both the illuminating power and the calorific value are maintained at one uniform standard.

Experimenting with Tar on Roads.

The question of the disposal of residual products, and their effect upon the manufactured price of our main product, must always be of immediate interest. We cannot therefore be unmindful of the attention now being given to the use of coal tar in the endeavour to solve what is known as the dust problem on roads. The evolution of motor locomotion is causing road surveyors and local authorities considerable anxiety in this respect; and experiments are being made throughout the country, with various substances and solutions, with a view to minimizing or curing this dust nuisance. Tar in various forms, and mixed with oil, &c., and tar just as it comes from the works' tar-well, have been advocated and tried with varying success in different districts. The Local Authority I am connected with have had the matter before them, and have carried out experiments with a number of remedies. We find painting with tar freed from water, but still containing the light oils, the most effective material. The following is the method employed: The road to be treated is well rolled and thoroughly swept with bass brooms and then with hair brooms, so as to remove all the dust. The tar is then poured on the road and well brushed in, and when it has stood about half-an-hour sprinkled with grit and sand, after which the road can be opened for traffic. The total cost works out to 1·15d. per yard super; and one gallon of tar will cover 8 super yards. In our opinion, tarring the roads in this manner gives superior results as a dust preventive than are obtained by using the dust-laying compounds now on the market, as the tarring stops the disintegration of the road surface and gives it an improved surface and appearance—also saving a considerable amount in scavenging, watering, and maintenance.

Now, tar always has been one of the most difficult residuals to dispose of in small works; the distance from the tar distillers' works, and often the cartage to the railway station, with the carriage added, leave very little margin of profit from its sale. For the purpose just referred to, we have an opportunity of developing a local trade for tar; and it only needs a little trouble and pushfulness in bringing the matter before our highway surveyors and road authorities to create a demand which will not only solve the problem as to its disposal, but enable us to realize a much better price than is at present obtainable.

Usefulness of Commercial Sections.

With regard to coke, on looking through the returns of our Commercial Sections, I find that we have undoubtedly obtained generally during the past season a good all-round price for this residual. I may here say that the work done by these sections of the Association has, I believe, greatly extended the usefulness of our organization and benefited the industry generally in our district. Although, in the nature of things, coke appears to be the first and constant care of these sections, it must not be overlooked that there are many more matters of vital interest and importance dealt with from time to time; and it is being demonstrated again and again that the knowledge and experience of even a few concentrated for the moment upon the immediate requirements of the one, are a great source of strength and assistance.

Waste in the District.

Turning for a moment to glance outside our works, distribution and supply occupy our attention almost, if not quite, as much as manufacture; and perhaps the first important matter is the discrepancy between the works station meter and the gas recorded and charged for in the gas-rental—in other words, the unaccounted-for gas. Of late years, instead of laying all the waste to leakage in mains and services, it is recognized that this loss arises from various causes. For instance, holders blowing or leaky, defective meters, public lamps burning without governors, or with governors that have been allowed to stick and remain so, neglect in the proper regulation of pressure in the district mains, &c., all contribute to what we call "unaccounted-for gas" in our accounts, a considerable percentage of which is, in my opinion and speaking from practical experience, preventible waste.

The Maintenance of Our Lead.

The fact that we have in present-day business keen competition has undoubtedly acted as an incentive in lifting us out of the old rut of protected monopoly. In our earlier days, the gas manager's whole time and attention were concentrated on the manufacture and distribution only as far as the consumer's meter. But to-day, to be up-to-date and successful managers, we must be possessed of good all-round commercial qualifications, a thorough acquaintance with sound business methods, and powers of observation, application, and energy. Our industry to-day may be said to be in a thoroughly healthy condition. We have proved that when cost, convenience, and certainty are considered, the commodity that we supply for light, heat, and power, gives the greatest all-round satisfaction to the public generally. But though we hold a very strong position at the present time, we must not think of settling down or resting on our laurels, if we are to maintain our lead. Every effort must be made to produce suitable gas at the lowest possible price, to obtain the maximum amount of light for illuminating purposes, and the utilization of all the available heat when used in cooking and heating apparatus. We must keep in touch with, and follow up, the continuous development in the various types of burners, heating and cooking stoves, &c., and instruct and advise our customers generally as to the best systems for light, heat, and power. To my mind, the undertaking that neglects these important functions, although it may meet every legal obligation placed upon it, fails in one of its chief duties to its consumers.

And now I must finish, if we are to carry through our programme in schedule time. I have, in the short time at my disposal, touched but briefly upon the present conditions of the gas industry, and matters on which our energies and efforts may be specially and profitably devoted. In an Association like this, although we are not competitors, we may be, and ought to be, rivals in striving to work out the best systems and obtain the best results.

Mr. Shadbolt observed that Shakespeare had written that "one man in his time plays many parts." If Shakespeare were with them now, he (Mr. Shadbolt) wondered what he would have thought of the exemplification of the truth of his wise remark that they had in their President of that day. Without fear of contradiction, he might say there was no one member of the Association who filled so many parts as did their President, of one kind and another, and filled them with credit to himself and advantage to those he served. He not only occupied the position of Engineer and Manager of the Cleethorpes Gas-Works, but he served the public on the District Council of Cleethorpes, and had different public claims on his time, he was President of the Association and also represented it on the Council of the Institution. Yet he could find time to produce an address of this kind—up-to-date, alive, and expressive of the present state of gas affairs. He was a gentleman of whom the members might, on the score of merit, be proud to have preside over them. He had pleasure in proposing a vote of thanks to the President for his address.

Mr. Brearley seconded the motion. He remarked that the address was an eminently practical one; and it seemed to him that the President had sounded the death-knell of continuous charging, but by no means the death-knell of vertical retorts. Personally, he had great hope that the vertical retort would in the future run slopers and horizontals very closely. He had listened with delight to the address; and he doubted not that in this he was voicing the sentiment of the members generally.

The President briefly thanked the members for their acknowledgment.

The Spring Meeting.

Mr. J. Carter (Lincoln) said, without binding himself as to the date, he had great pleasure in proposing that the next meeting be held in the city of Lincoln.

Mr. Davis seconded the motion. He remarked that it was about sixteen years since the Association last met in Lincoln, and he was sure they might look forward to a most pleasant and instructive time.

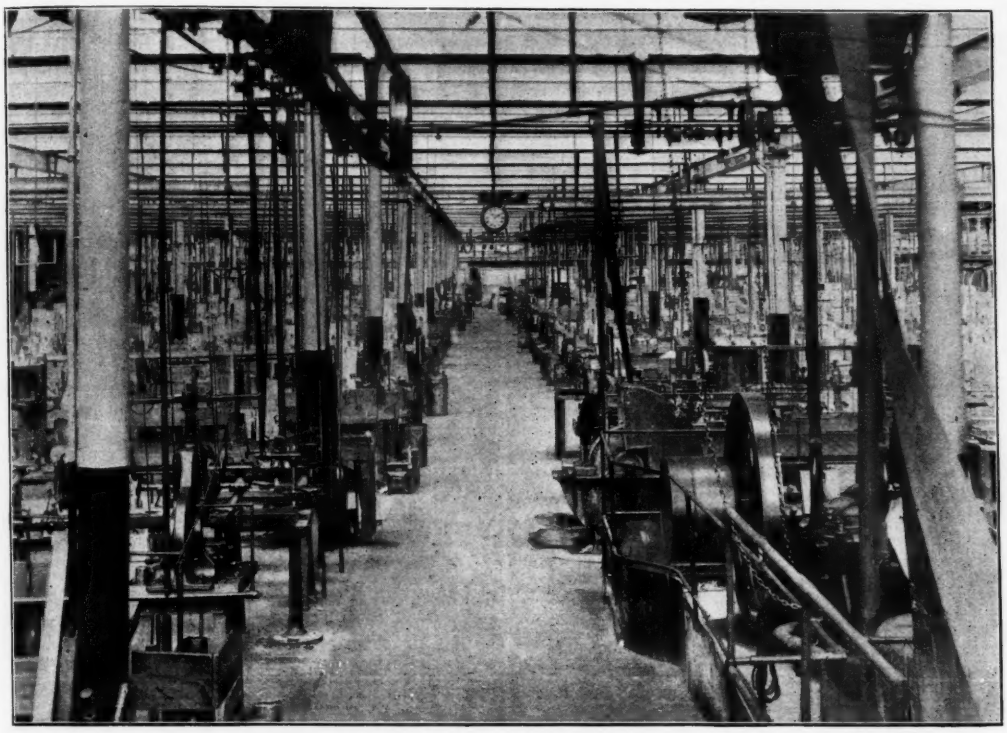
The motion was unanimously carried; and this concluded the business proceedings.

THE GOTHIC METER WORKS AND THE GAS-METER TESTING-STATION OF THE MIDDLESEX COUNTY COUNCIL.

[For Plan, see p. 27.]

A great treat was in store for the members and their visitors. After leaving the Forest Hotel, the party were driven to the Gothic Works, Angel Road, Edmonton, to inspect the meter-works of Messrs. Thomas Glover and Co., Limited, and the stove-works of Messrs. R. & A. Main, Limited. On arrival, they were received by Mr. Richard T. Glover, the Chairman of the firm, Mr. Kenneth Aird, Mr. Thomas Glover, jun., Mr. F. J. Beaumont, Mr. A. G. Melhuish, Mr. Glover Clark, Mr. S. F. Chamberlain, and Mr. W. O. Shildrick—all of whom were most courteous and informative, and did their utmost to interest the visitors. In works of such magnitude, with modern equipment, and devoted to special branches of manufacture for the gas industry, no one could fail to find interest. In addition to the technical part of the business, it was also seen, with gratification, how thoroughly the firm identify themselves with the welfare of their employees, and aid them with munificent hand.

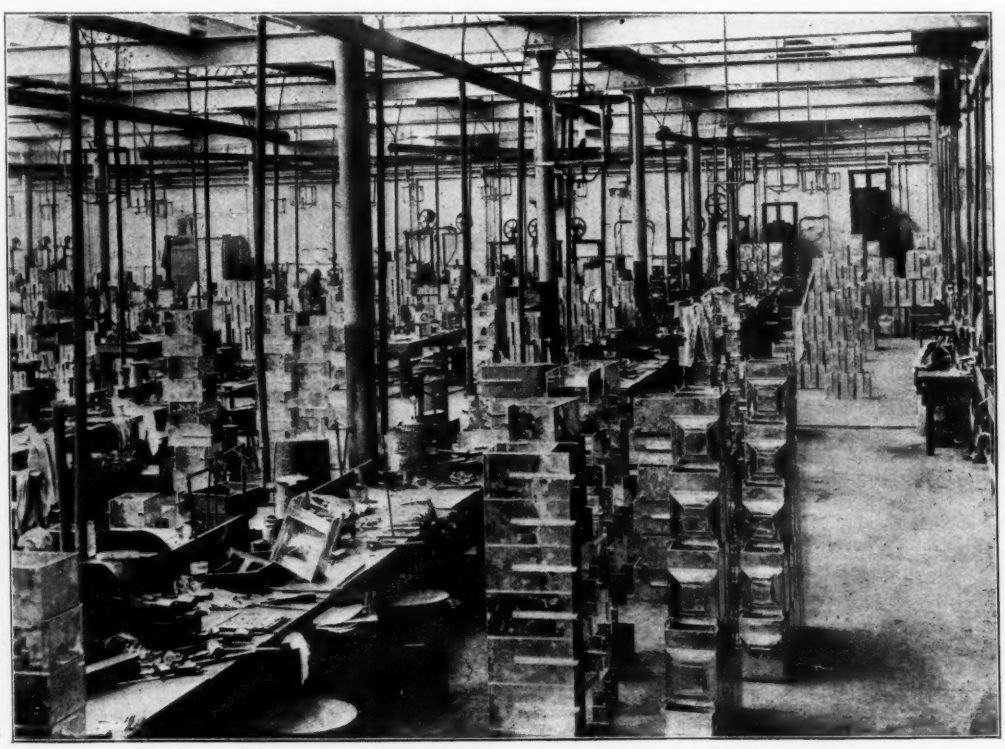
Before wandering through the works of the firm, the visitors were, by the kindness of the Inspector, Mr. W. E. Barney, shown over the gas-meter testing-station, which is under the control of the Middlesex County Council. The meter-testing station adjoins Messrs. Glover's works; the County Council having adopted the Sales of Gas Acts, 1859 and 1860, upon Messrs. Glover's factory being removed to Edmonton. The building was erected, and the station equipped complete, by Messrs. Glover. The apparatus consists of fourteen 10 feet and one 20 feet standard test-holders, each fitted with experimental meters, King's gauges, and burning-off lanterns. The beautiful appearance of the whole of the apparatus was the source of very general admiration. The test-room is 70 feet long by 45 feet wide, and is lighted entirely from the roof; the lights being constructed so that, when required, they



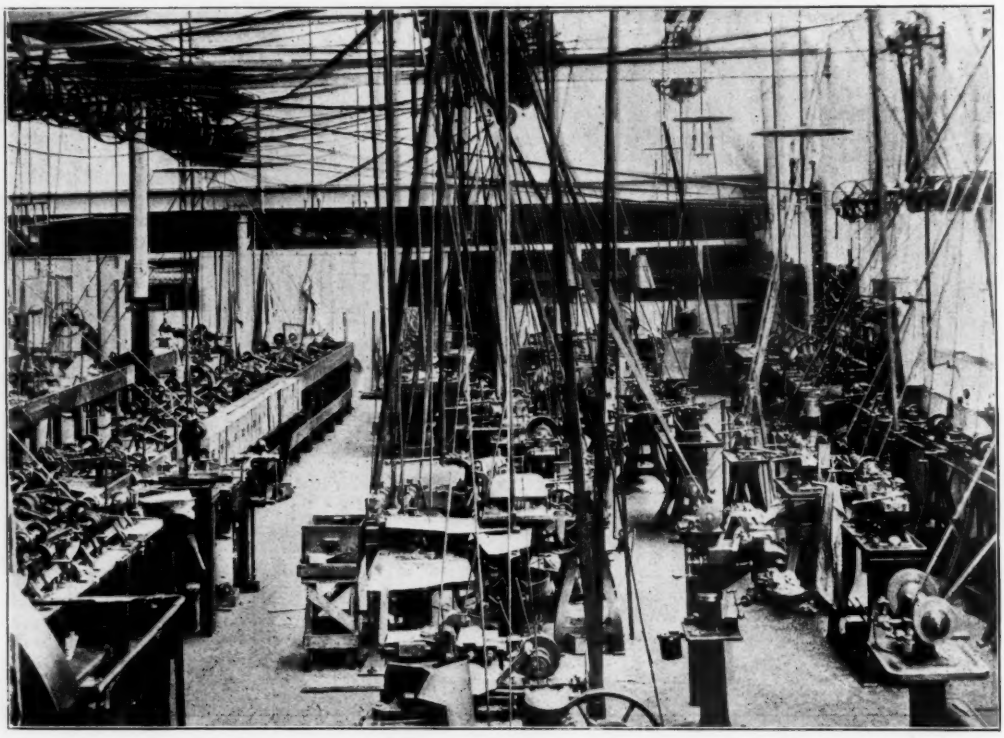
Tin Shop.

may be opened for ventilation. A gas-engine-driven fan, taking in its air supply from eight underground ducts, is also employed for ventilating. The roominess and cleanliness of the place make it a desirable one in which to work. There is a mess-room for the men, also a store and hot-water boiler-house, and usual offices. The staff consists of an inspector, a clerk, eight assistants, and a porter. The station is equal to an output of 2000 meters per week. During the six years it has been in operation, 474,000 meters have been tested—practically all being new and repaired meters of Messrs. Thomas Glover and Co. It is one of the most recently equipped of meter-testing stations, with the latest instruments for use in the testing of gas-meters.

From the testing-station the members passed into the extensive and busy shops of the firm, where meters of all sizes were seen in course of manufacture, but prepayment ones predominated. It may here be of interest to give a few particulars of the early days of the firm, for it has an interesting history. It was founded in 1844, for the purpose of manufacturing dry gas-meters, under the title of Croll and Glover. Some time previously, owing to the demand for a reliable dry gas-meter, Mr. William Richards, among others, made a large number of experiments, with a view to overcoming existing defects. All the other devices were considered; and it was seen that they could not possibly be utilized, except after extensive improvement. Subsequently, Mr. Richards became associated with Mr. Croll, and considerable progress was made. It was not until 1844—when they took the late Mr. Thomas Glover into their counsels—that any measure of commercial success was achieved. Mr. Glover had been connected with the gas apparatus business in Edinburgh for some time previously; and his thoroughly practical knowledge and business ability were all to the good in getting the dry meter shipshape and saleable. Many defects in the original invention were ovecrome by him.



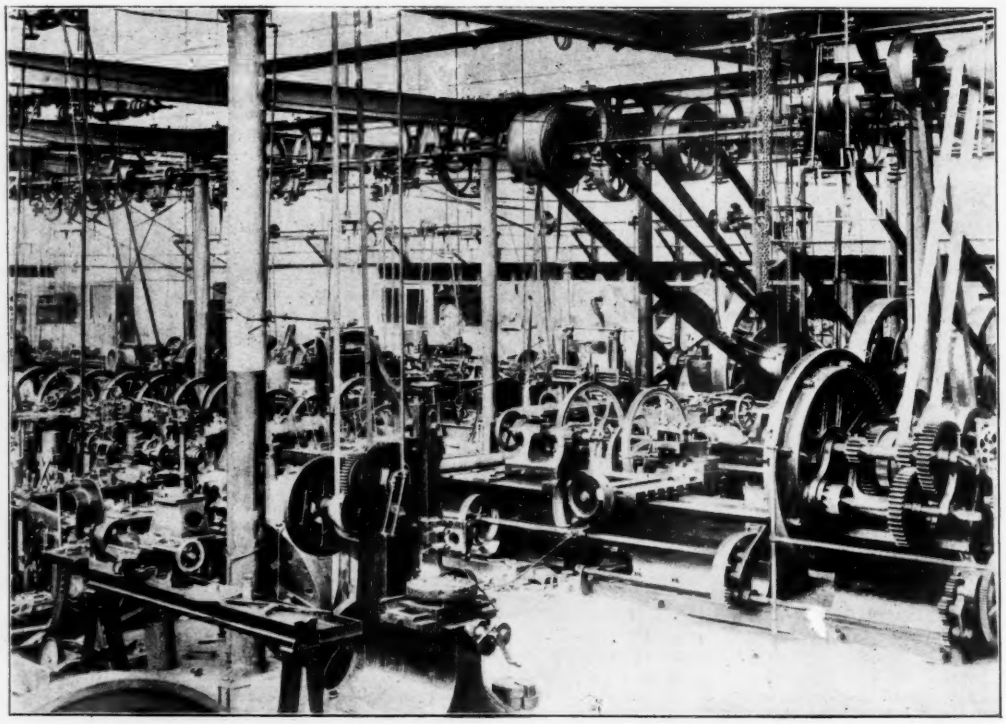
Tinmen's Benches.



Brass-Work Machine Shop.

But the principal step was the introduction of a set of valves; and subsequently he acquired full control of the business. Since that time, the firm of Thomas Glover has been inseparably connected with dry meters. It is an undeniable fact that, as Clegg's drum in the wet meter is the primary principle of that meter, so is the primary principle of all dry meters attributed to the successful working out of his invention of the valves by the late Thomas Glover. Mr. Glover lived to see many thousands of his meters made and in use; the demand for them naturally increasing with the spread of gas consumption. Unfortunately, in 1868 Mr. Glover died; and his wife, though burdened with a young family, courageously and successfully carried on the business with the assistance of her brother-in-law, Mr. John Glover, sen., till her sons were old enough to enter the firm. When this interesting event happened, Mr. Richard T. Glover and Mr. John G. Glover undertook the control of the commercial and mechanical portions of the business respectively.

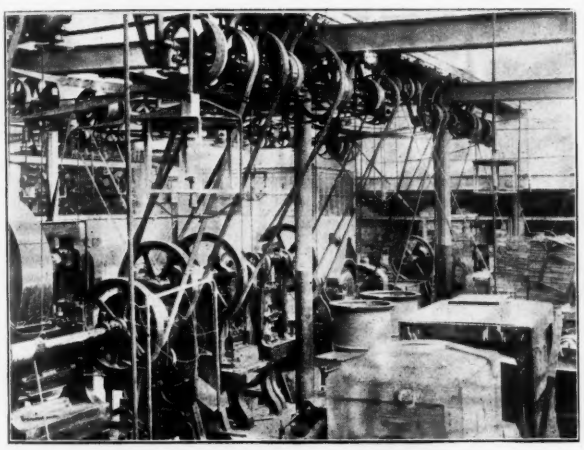
Meantime the business had prospered exceedingly; and it became necessary to develop it in various directions. One of these occurred in 1897, and took the form of an amalgamation with Messrs. R. & A. Main, Limited, the well-known manufacturers of gas-stoves—from a boiling ring up to the complete cooking apparatus for (say) a large hotel. Previous to this, Messrs. Thomas Glover and Co. had also embraced the businesses of Messrs. John Tomlinson and Co., and Messrs. Wm. Cook and Co., Limited, engineers and lathe and machine manufacturers. The Board of Directors at the present time of these joint concerns consists of Messrs. Richard Thomas Glover, Thomas Glover, Sir Paul A. Makins, Kenneth Aird, Thomas M'Kinnon Wood, M.P., Robert B. Main, and Archibald P. Main.



Machine and Tool Shop.

The business was founded, and for upwards of 24 years was carried on solely, at Suffolk Street, Clerkenwell. When it had outgrown the capacity of the original factory, a large block of buildings was acquired in St. John Street, Clerkenwell. The accommodation of these two factories was sufficient until early in the last decade of the Nineteenth Century, when, owing to the introduction of prepayment gas-meters, it was found necessary to acquire other premises, four other factories were taken in rapid succession, with the addition of a machine-tool shop at Vauxhall. Eventually, in 1898, the present site of 19 acres in the Angel Road, Edmonton, was acquired; and it may be interesting, in view of the Association meeting at Tottenham last Wednesday, to know that this site was acquired on the advice, and through the instrumentality of, the late Mr. W. H. Broadberry. The removal was completed in 1900; and it is a curious coincidence that the last meter made in Clerkenwell was No. 1,000,000, and the first made at the Angel Road No. 1,000,001. Since that date, no less than 300,000 dry meters of various sizes have been made at the Gothic Works, and 200,000 meters, both wet and dry, of all makes have been repaired—90 per cent. of the total number of meters being subsequently taken for stamping to the adjoining gas-meter testing-station of the Middlesex County Council.

Taking first a general view of the works, there is a large galvanized iron building immediately inside the entrance gates, which is used as a mess-room and recreation-room by the employees of Gothic Works; the whole being managed by a committee of men as a Working Men's Club. In connection with this, is a Co-operative Stores (under separate management), from which the members can be supplied with anything from coals to clothing. Next to this is the Middlesex County Council Gas-Meter Testing-Station and two temporary buildings, used at the present time as Offices and a Drawing-Office. The present works cover (out of the 19 acres) an area of more than 3 acres; the main shop having two acres of floor space on one level, and constituting almost the



Corner of Tin-Press Shop.

largest single shop in London. The roof is of a type known as saw-tooth. The machinery is driven by gas-engines; and the factory is lighted throughout by high-pressure gas lighting (Sale and Onslow's patent). The gas is supplied from the Tottenham and Edmonton Gas-Works by means of two 6-inch mains—one supplying the gas-engine and one the gas to the test-holders and the compressor for high-pressure lighting. The works are connected with the Great Eastern Railway by means of a siding; the side of the building nearest the railway for nearly the whole length of the building being used as stores. The machinery is divided into two sections, at the north and south ends; the intervening space being filled with tinmen's benches. At the present time, more than 500 hands are employed.

Entering the factory by the north end, the first shop is the foundry for brass, gun, and white metal. In between this and the main building are two shops, which are used as a paint shop and packing department, respectively. The first section of the main building consists of the brass, machine, and fitting shops. This is occupied with a large number of machine tools, many of which are designed and made throughout at the Gothic Works. On the left is a large room—designated "the museum"—surrounded by shelves, which are filled with over 100 different pattern meters, mostly prepayment, illustrating the different stages of its progress, ranging from a 1s. coin meter, which was originally made in 1866, to the latest type. In addition, there is a large collection of experimental work, which will be found equally interesting. Immediately behind this on the one side are the benches where the prepayment meters are tested and adjusted before being dispatched; on the other side is the part known as the old brass shop, which is rapidly being superseded by improved mechanical methods. On the west side of the building are the stores, extending for more than 100 yards down to the stamp shop, where the various tin and iron parts of the meters are cut, stamped, rolled, pressed, &c. Between the stamp shop and the brass shop are the tinmen's benches; the first section, nearest the stamp shop, being used for large meter work—from 20 lights up to 3000 lights. The second section is for repair meter work; and the third section, for making new and ordinary prepayment meters up to 10 lights—the whole being arranged for ease in handling. As the meters have to go through their successive stages, they are brought nearer to the north end of the building, where they are handled for packing, painting, stamping, &c.

The left or east side of the building is occupied by a large number of holders used for sounding, setting the valves and testing the meters as they go through their various stages. It is interesting to note that every ordinary meter has to go to these holders for testing, &c., three times, and prepayment meters four times. Adjoining the holders are ranged dark rooms, in which the skins used for the diaphragms are cut out and examined before being passed to that part of the shop where they are made into complete diaphragms. One of these dark rooms is fitted up as a photometer-room, where a great deal of testing is done in connection with Messrs. Thomas Glover and Co.'s adaptation of the Sale and Onslow system of high-pressure gas lighting. Then, beyond these dark rooms are two out-buildings—the first being occupied by a large stamp drop hammer, which weighs over 1¼ tons, falling on an anvil of 13 tons, which is used for forming the larger parts of the meters which have to be stamped—the dies being over 2 ft. 6 in. in diameter. The other building is the smiths' shop. Near to this is the diaphragm shop, where the diaphragms are banded and fixed on to their rims. The next portion of the works is the machine shop, which is chiefly occupied in making and repairing tools for use in the works. In addition to this, lathes are made, and a large quantity of other work is handled, in connection with outside business.

The next section of the works is entirely devoted to the stove business of Messrs. R. & A. Main, Limited, which is only used for fitting up stoves for the London trade. The whole of the castings are ground and finished by Messrs. Main, at the Gothic Iron-Works, Falkirk; only the actual fitting together being done in London. Adjoining the stove-shop, a large iron foundry will shortly be erected for turning out the iron castings for stoves and for general use in the works.

Reference has been made to the use of the Sale and Onslow high-pressure system for lighting the works. Before the members left, the shops were lit up for their inspection; and it was a magnificent illustration of works' lighting on a large scale. There were no dark places; and every man was working in a soft rich light. The main shop is lit by a No. 1 compressor; and it supplies 200 lights, each of 500-candle power. From that one compressor the meter and machine shops are lighted. The stove-shop is lighted by gas supplied from a separate compressor of 2-horse power. In this shop there are thirty 500-candle power lamps. The efficiency obtained by this system of lighting is about 36 candles per cubic foot of gas consumed.

In connection with the provision made for the comfort and entertainment of the men, the firm also grant them allotments from their vacant land for cultivating purposes; and there are 150 pieces of ground so allotted. If other men desire a piece, there is a large extent in possession of the firm which they have secured with an eye to developments.

After the first inspection of the shops, the visitors found a very welcome tea awaiting them in a large marquee. The thoughtfulness of the firm was highly appreciated; and expression of that appreciation was entrusted to Mr. Carter. He remarked upon the delight of the members with all they had seen in the works; and upon the open-handed hospitality of the firm. Mr. Thomas Glover (Norwich), in seconding, said the provision that had been made for the members had certainly been very welcome, and the inspection of the shops had been an object-lesson. There was a hearty ring in the applause with which the visitors endorsed the motion. Mr. Richard Glover, in reply, said the firm were very pleased indeed to have been honoured with a visit from the Eastern Counties Association; and he trusted the members would carry away pleasant memories of their visit. At all times, they were pleased to show gas engineers anything that might interest them at the works.

This ended the programme for a day that had been replete with interest.

The Midland Junior Gas Engineering Association.—The first general meeting of the Association's second session will take place, at the City of Birmingham Technical School, next Saturday. The President for the year (Mr. G. W. G. Tatam, of Saltley) will deliver his address, and this will be followed by a paper by Mr. W. Angus, of Nechells, on "Coal and Coke Handling Machinery."

The Engineering and Machinery Exhibition.—In connection with this Exhibition at Olympia, of which a notice appeared in the "JOURNAL" for the 18th ult. (p. 755), lectures are now being delivered. Next Thursday and the following Thursday, Mr. H. A. Humphrey, M.Inst.C.E., will discourse on "Gas-Engines." To-morrow evening, Mr. George Humphreys-Davies, F.S.I., will give a lecture on "The Rating of Machinery." The author being a recognized authority on this subject, his lecture should be of interest to manufacturers, in view of the attempts that are frequently made to rate tenants' machine tools.

MODERN GAS-FIRES AND OTHER HEATERS.

Richmond Gas Stove and Meter Company, Limited.

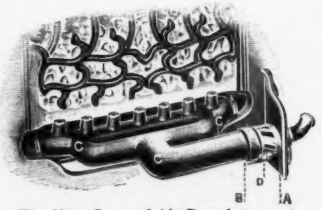
(London and Warrington.)

THE farther inquiry goes, the more convinced are we that the makers of gas-fires are breaking from traditional models, and crudeness in operation is year by year giving place to greater refinement, with consequent improvement in economy and efficiency. Inspecting the fires of the Richmond Gas Stove and Meter Company, Limited, several points in the newest types afford food for reflection, and lead to examination with the view of ascertaining whether there is any rational cause for effected changes. We may take the new "Castilian" fire as the base for a little disquisition on points. The first feature of the fire that claims attention, because it is the first thing that meets the eye, is that it is a departure from the old shape and conventional styles of ornamentation. It has a casing with an art-black, and, to large extent, a plain surface, with bold reliefs. It is a type of casing that meets with approval; and there is a growing demand for it. But report has it that it is all very well for the makers to propose; it is the public who dispose, or rather demand. A maker may try to tempt, but the public taste is slow moving where change is concerned; and it will be a long day before the request for old forms of casing is completely extinct. But the Richmond Company are determined as soon as possible to make a clean sweep of the old style of ornamental types of fires. Then it is noticed

The "Castilian."

that this fire is slightly built in depth, which gives it a more graceful appearance; and when placed before an ordinary coal-fire grate, it will not project with such bold obtrusiveness as some of the old fires. This lessened depth from back to front is an effect of a combination of causes, all arising from the use of a gas and air adjuster. Made possible by the greater efficiency obtained by the employment of the adjuster, shallow bricks are used, with a single layer of fuel in front, instead of a double one. There can be little question that sufficient credit has not hitherto been given to the value of the heating-up of the brick. Here we have one direction in which to look for economy in gas consumption, by making use of the heat from the brick, instead of screening it behind two rows or a greater mass of fuel, and allowing it to find its easiest outlet up the flue at the top of the fire, because the greater the depth of fuel the larger must be the canopy opening. Gas has to be expended in heating up the brick; and if use can be made of that heat, then there is economy in it. For whereas (say) 35 cubic feet of gas had to be consumed the first hour in heating up the mass of fuel and the brick, only about half that consumption, or a little more, is now needed to obtain the same effect. In this "Castilian" fire, we find only one single layer of fuel, and quite a narrow opening in the canopy suffices for the products of combustion. With the narrow opening, if there were the same consumption of gas as of old, the volume of the products of combustion would not, of course, be able to get away. The fuel, too, is now so disposed that the gas-flame plays up the centre of the pieces, heating them uniformly from bottom to top—in much the same way as a gas mantle is made incandescent from the internal flame.

But the further aid to economy is in the adjustment of the gas and air supply; and it is to this that the firm have principally been devoting their attention. The adjusting device which is being applied to their most popular fires, is a very simple arrangement, and most effective; the character of the flames showing that a perfect mixture can be obtained by a minute's care in regulation. By the one milled collar of the adjuster situated between the supply-pipe and the burner, the regulation of both gas and air is achieved. The adjuster consists of two cylindrical portions, which slide one into the other, and are slotted obliquely—forming the air-inlets D. The inner cylinder carries a small plug pierced through the centre and having at its periphery three semi-conical grooves. This plug engages with the gas-inlet piece A, on the outer cylindrical piece, at the gas-supply end; and it will be understood that, when



The New Gas and Air Regulator and Burner.

fitted together, the mere turning of the milled edge B at the opposite end, owing to the shape of the grooves in the plug, diminishes or increases the gas supply, as the case may be. Once the gas is adjusted, then the slightest turn of the milled edge again in the one direction or the other will harmonize the air supply to the gas; and then the device is fixed by a set-screw. We need not more particularly describe the patented arrangement.

So, we see all round that hap-hazard method in gas-fire construction is being left behind as a matter of history; and scientific control is falling into its place. In saying this, it must be remembered that as far back as 1900, the Richmond Company had an air-adjuster; but this season sees the introduction of both gas and air regulation.

This brings us to the removable burner, which is also new in construction. The burner has three tubular chambers. The gas passes into the first C, which feeds centrally into the second; and the second feeds into the third (which is fitted with gas nozzles about half the area of those of previous seasons) at either end between the last and the next nozzle C C. By this means a uniform distribution of the mixture is obtained to all the nozzles—it having been found with the old burners that, instead of there being equality in the height of the flames, the end nozzles often had the lowest ones. The result of the arrangement is that the gas and

The "Ilford" Fire with Front removed, showing Adjuster and Burner.

air get a good travel before reaching the point of combustion, and a uniform incandescent fuel surface is obtained instead of a gradual decline in brightness towards the sides—this being also aided by the new form of fuel and its arrangement in the fire. As previously remarked, the fuel is disposed so that the flame plays directly up its interior. This has been rendered partly necessary by the lessening of the consumption of gas; the height of the flame being naturally limited. One other point in this connection. Attached to the inside of the fender of the fire is a white enamelled plate curved out so as to fit between the burner nozzles. This prevents the fuel dropping lower over the burner than the plate; but a more important effect is that the reflection from it imparts a surprising brightness to the incandescent fuel, to a degree which is only properly appreciated by removing the white enamelled plate and trying the fire without it.

Perhaps we might suggest that trial be made another season with a white enamelled plate inside a sloping projecting canopy to see whether still greater brightness and life can be imparted to the incandescent fuel. All these improvements have one after the other been examined without disconnecting the fire; and we cannot refrain from turning the thoughts back to the time when gas-fire makers built as though the inside of a fire was not intended to be examined until the crack of doom.

Combined, these improvements mean that with fires so constructed, using gas at 15-10ths pressure, a 10-inch fire will give excellent results with 16 to 18 cubic feet of gas (of course, depending on the quality), as against 30 feet under the old conditions. With a 12-inch fire, the consumption, under like conditions, is from 22 to 24 cubic feet, against 40 cubic feet. The old conditions produced waste; the new have brought about a great advance

in economy. [We are asked to state that the new gas and air attachment is supplied with the "Ilford," the "Waverley," the "Richmond," the "Gordon," and the "Stratford" fires, as well as the "Castilian."]

Only a rapid glance can be given to other of the firm's fires. The "Winchester" is a high-class gas-fire, made to suit the decorative requirements of large rooms, libraries, hotels, &c. The copper *repoussé* panels, which encase the fire, conceal the whole of the coal grate before which the fire may be fixed. It is made in one size—a 13-inch fire. The new "Basket" fire is an extension of the firm's well-known "Reform" register gas-fire. The "Monarch" gas-steam radiators, we learn, are now made in all sizes from three to eleven tubes, both plain and ornamental. The "Venetian" is a new hot-air tubular stove, with luminous flame, and made in three sizes. The stove is light and graceful in appearance, and is fitted with a coloured glass lighting door. It is fitted with a patent duplex tap; the bye-pass being set so that the gas consumption may be reduced by one-half after the stove has been heated up. The same series is also made with hot-air ventilating-tubes, running through the centre of the radiating tubes; thus greatly increasing the heating power. These radiators are supplied with four, six, or eight tubes.

The "Venetian" Radiator.

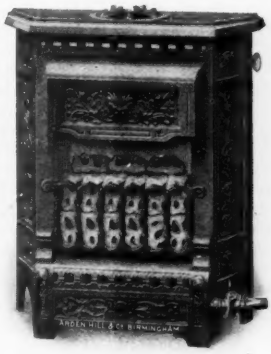
Messrs. Arden Hill and Co.

(Birmingham.)

Looking at the extensive range of Messrs. Arden Hill and Co.'s "Acme" gas-fires, one would, without inquiry into details, be somewhat at a loss to know upon which types to fix one's fancy. The designs are many and distinctive; and from them the taste would be difficult indeed to please that could not be satisfied. But by those with knowledge of these things, all the latest improvements would be wanted—means of regulating the gas and air supply, and facilities for cleaning and renewal, which are potent aids to economy. They are to be found in most of the Company's fires; but picking out two fires for special notice, choice falls upon the "Boreas" and the "Argus." These are two of the new designs for the season; and they are both made in three sizes of varying height, and with 6, 8, or 10 inch fires. They are fitted with patent removable fire-brick linings, heat deflector, and "Simplex" burner—the "Argus" being also furnished with a boiling-burner on top. The new "Simplex" burner (with the fuel and fire-brick combination) was described in noticing Messrs. John Wright and Co.'s new fires a fortnight since; and Messrs. Arden Hill and Co. are employing it under license from that firm. It will be remembered that it provides a separate adjustment for the gas and air supply, that it can be regulated while the fire is alight (and then locked in position), that there is nothing in it to get out of order, and that it is very accessible. The air and gas supply regulators are distinct; and they enable the fire to be used whatever the pressure may be, or whatever the heating power of the gas. There is no doubt about the saving effect of these regulator burners; and about the resulting heating power and cheerful appearance of the fires. The finishes in which the fires are supplied are black or porcelain enamel.

The "Boreas."

The firm are also this season introducing a single column gas-heated steam-radiator, under the title of the "Mars." It is entirely self-contained, and is fitted with an automatic valve, which regulates the heat, so as to maintain an even temperature and economize gas. The radiator is made in plain but effective designs; and with four, six, eight, or ten single-tube loops. The depth of each size is $7\frac{3}{8}$ inches; and the width increases by 5 inches for each size from $13\frac{1}{2}$ inches for the four single-tube loops. All sizes are made in heights of 30 and 36 inches. For the 30-inch height, the average gas consumption per hour, to keep the radiator at 216° Fahr., is with four tubes $4\frac{1}{2}$ cubic feet, six tubes 6 cubic feet, eight tubes 8 cubic feet, and ten tubes 10 cubic feet. With the 36-inch high radiators, the consumptions for the four sizes are respectively $5\frac{1}{2}$, 7, $10\frac{1}{2}$, and $13\frac{1}{2}$ cubic feet. The radiators are finished in black, green, or dark chocolate enamel.



The "Argus."

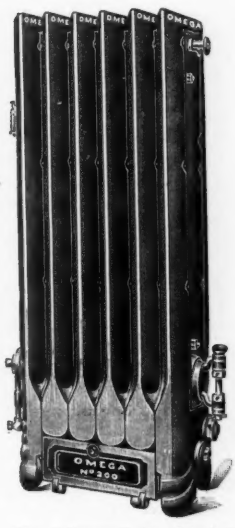
Omega Odourless Gas-Stove Company, Limited.

(Bristol.)

This Company draw attention to several new patterns of their heaters, and to some very serviceable innovations in gas apparatus. There may be among readers some who are not cognizant of the principles upon which the "Omega" gas-heaters are constructed, which principles, in the first place, are claimed to combine "great efficiency, complete combustion, and indestructibleness." The heating and circulation of the air of rooms by passing it through specially designed chambers in a stove heated by a gas-jet is a brief, if incomplete, presentment of the fundamental feature of the system. Among the advantages set forth by the Company are these: (1) Sterilization is accomplished by subjecting the air currents passing through the chambers to such intense heat that all disease germs and organic matter are absolutely destroyed. (2) As the air in a room is rapidly drawn through the heater, it is purified, and kept at a normal degree of humidity; the effect being a perfectly pure, moist atmosphere, at a regular temperature. (3) Perfect combustion is secured by the heating and the thorough mixing progressively of the gas and air; the mixture being burned in a patented burner. (4) By the mixing and superheating, the discharge of noxious vapours is entirely obviated. (5) Therefore no flue is required in a room where the ordinary laws governing proper ventilation have been observed. (6) Many of the patterns of the stoves can be moved from room to room, provided there is a suitable gas connection. The atmospheric flame burns in a central position in the stove; and the construction of the

The "Omega NA" Heater.

The "Omega L1" Heater.



The "Omega" Gas-Heated Steam Radiator.

chambers and baffles surrounding this is such that the air drawn in at the bottom part of the casing makes a circuitous journey before being discharged at the upper part. It is calculated that the passage of air is at the rate of approximately 200 feet per cubic foot of gas consumed.

Notice of all the Omega Company's designs would occupy too much space; but one of the new patterns is distinguished by the letters "N A." This is for rooms measuring up to 15 feet square, or 3000 cubic feet area. The illustration shows the stove to be suitable for libraries, small halls, shops, offices, &c. Its height is only 29 inches; and the size of the base is 16½ inches square. When full on (a condition not continuously required), the gas consumption is 15 feet per hour, at 2 inches pressure. The styles of finish are various—polished black, rich brown porcelain enamel, and polished Venetian bronze, with burnished copper pillars. Another new type (pattern L1) is a useful stove of the small sort, suitable for offices, cupboards, bath rooms, photographic dark rooms, and countless other situations of restricted area—say, up to 7 feet square. The height of this stove is only 13 inches; and the consumption of gas is about 8 cubic feet per hour. This stove can be fitted with a regulating-tap, as shown in the illustration.

Steam radiators are, judging from the attention makers bestow on them, becoming more and more popular. The Omega Company have introduced one worked by a jet of gas. It is fitted with a water-gauge, and an automatic valve for shutting off the gas. On the inside, all parts are enamelled to prevent rust. It is made with four, six, eight, or ten double tubes. The height is 36 inches; the depth of the tubes 8 inches; and the width of six tubes 14 inches. There is a choice of finish between silver frost, art black, or porcelain enamel. Among the useful novelties of the Company is a "window drier" for the prevention of steamy shop windows. In form it is circular, with flat sides, but the principle of construction follows that of the Omega heaters. It is small, and not unsightly; being only 9 inches high, and finished in silver frost. The purpose is, of course, to supply warm air in the window; and—these are important considerations—by economical, portable, and safe means.

Oil-Tar for Roads.

Mr. H. Burrows, the Surveyor to the Lathom and Burscough Urban District Council, in a report respecting dust laying experiments, says that a better result was, singularly enough, obtained by not sweeping the road before applying the tar; the dust appearing to absorb the fluid and form a kind of protective carpet which deadened the sound of passing vehicles and preserved the surface from abrasion by horses' hoofs. He adds that his expectations have been more than realized; and it now only remains to watch what effect the winter traffic and weather have on the road. Provided the road stands as good as the untreated portion, it may be safely taken that a perfect dust palliative is at hand in oil-tar. One special advantage oil-tar possesses over the ordinary commercial dust-layers, he points out, is that it is a perfect mud preventive during or after rain; whereas other liquids have the effect of softening the surface and turning the road so treated into a soft, sticky mud, which is anything but pleasant, and certainly destructive to the road—at any rate, so far as keeping a perfect contour is concerned. Oil-tar has proved a lasting dust-layer; for at the termination of six weeks it was as good as when first applied. It has also preserved the road from wear, as there have been no loose chippings, while the other portions of the road surface have been covered with them. The cost of the oil-tar is by no means prohibitive; and Mr. Burrows considers its application well worth the expense, provided the County Council will allow it to be charged. The first application worked out at about £15 per mile for a six-yard road. Two dressings, he says, should be applied during the summer—the second at the end of about six or seven weeks—which would bring the expense to £22 per mile.

Mr. George King Harrison, of Hagley, whose death on the 16th of April last was noticed in the "JOURNAL" at the time, left £112,238. He had for upwards of half-a-century been associated with the fire-clay industry of Worcestershire and Staffordshire.

It is said that, owing to the cheapness of anthracite, gas-motors are in increasing demand in Italy. There are several manufactories in the kingdom; and it is growing more and more difficult for foreign motors to compete in respect of prices with those manufactured on the spot.

The "Board of Trade Journal" announces that *cheap* acetylene gas-generators, suitable for houses and more especially for the country, *with no risk of explosion*, and so constructed as to enable persons using them *to see from the outside at any moment how they are working*, might perhaps find a ready sale in the Venetian provinces. No doubt. The italics are used above to save space in comment.

The Secretary of the Machinery Users' Association (Mr. J. B. Caldwell) asks us to mention that at Stand No. 112A at the Engineering and Machinery Exhibition at Olympia the Association have an office where manufacturers can be supplied with information with reference to local rating and attempts that are being made to rate tenants' machinery; also with a list of districts which manufacturers who are seeking sites for establishing works with machinery should avoid.

PROTECTION OF A LARGE SYSTEM OF MAINS.

The following article on the above subject, prepared for the "American Gaslight Journal" by Mr. WALTON FORSTALL, appeared in the number of that publication for the 17th ult.

The average citizen and taxpayer, especially one living in a small town, believes that, with proper foresight on the part of the civic authorities and of the public service companies, all necessary underground structures can be placed in a street prior to its paving or repaving, so as to avoid any subsequent disturbance of the new surface for which the citizen has paid an assessment, and which he therefore regards as the veritable apple of his eye. As every gas man knows, the citizen's view is pure theory, and utterly incapable of accomplishment. But of this the citizen will not be convinced; and each time that an opening is made, the company making it and the municipal authorities are unsparingly condemned.

The above may be described as the theory of street openings in a small town. The practice in a city, and especially a large one, is a very different matter. There are now so many public service corporations laying underground structures, that openings, both for extensions and repairs, are of daily occurrence. In this continual disturbance of sub-surface conditions, the gas company is at a disadvantage as compared with any other company. The water company, steam company, and pneumatic tube company have about the same comparatively defenceless distributing system; but an ordinary leak of water or steam does no harm, and an air leak will be quickly known. A gas leak, however, may, long before discovery, make an explosive mixture in conduits and manholes. The "electric" companies—viz., the traction, light, telephone, and telegraph companies—have a distributing system which is not easily damaged, and which gives the central station instant warning when serious damage occurs. So, of all underground service companies, the gas company have most need to watch their structures. What is more, this need, and the expense entailed by meeting it, began sooner for the gas company. Except for the water company, they were the first on—or rather under—the ground. In the last fifteen years, one by one the electric companies have put their wires in conduits, until each street intersection is undermined by manholes, and from kerb to kerb the roadbed is filled with iron pipes and wooden and tile ducts.

What has been the effect of all this work upon the conditions of the gas mains and services? It is extremely probable that, except in a few of our largest American cities, most of the conduits have been laid without any regular surveillance from the gas company. This means that wherever a main was uncovered in the side of a conduit trench, the tile or the concrete bed was very close to, or touching, the main—making service tapping or split-sleeve repairs difficult and often impossible. Also, where the presence of a main in a manhole did not interfere with cable drawing or splicing, the manhole has enclosed the main without permission being asked. This enclosed portion at once becomes inaccessible to the gas company, according to manhole ethics as laid down by the electric companies, until permission to open the manhole has been asked and obtained. Little as any particular gas company might be inclined to ask this permission, especially when hunting for bad leaks, the asking becomes no formality when manhole covers are locked, or where, if not locked, the current carried is of high voltage, and prudence demands the presence of an employee of the electric company.

Consequently, the gas company whose officers have not closely watched the installation of conduits realize one day that many of their mains and services are more or less embedded in and under ducts, and that in manholes and manhole walls are mains and specials. The possibilities in manholes from leaky joints or broken mains are not pleasant to contemplate; and cast-iron mains, especially in small sizes, may not be strained with impunity. If a 2-inch main affords an easy way of getting in or out of a manhole, it is a very possible occurrence that an extra heavy man may some day cause a slight crack. The first knowledge of an unholy union between gas and electricity may, and often does, come from a series of manhole explosions, in which broken covers and shattered ducts may cover the whole damage.

Whether because of such accidents or from any other reason, let it be assumed that the manager has decided that both prudence and economy dictate a new policy in regard to watching the distribution system. There are two things to be done: First, to make sure that in the future any opening, uncovering or coming close to a main or service will be seen, and proposed or actual encroachment or damage to the gas structure prevented or reported for the manager's action; second, to investigate all existing dangerous conditions, which practically means examine all manholes which probably enclose mains.

To accomplish the first object, a systematic inspection of the whole system of mains must be started. Important thoroughfares and those containing the largest mains must be visited oftener than the streets in which there are apt to be few openings and the mains are small. By intelligent planning, very effective protection can be obtained at comparatively slight cost—say, $8 (33s. 4d.) per mile of main per year. Bicycles should be used by the inspectors, except possibly in the congested traffic centres. A report should be made of every opening seen. Where a trench is being opened parallel to a main, and the latter is exposed, it will often be advisable to set aside a man as watcher on this

particular job, to ensure that the structure being laid is kept at a proper distance from the main. An endeavour should always be made to agree with the other public service companies upon the minimum clearance distance allowable from different-sized mains. These companies will usually be reasonable on such points, and issue proper orders to the street gangs; but, of course, where space in a street is very limited, the ordinary street foreman will break rules made for another company's benefit, where these rules interfere with an economical or proper installation of his structure. It is to prevent the yielding to temptation by such foreman that the "line-walker" and the watcher are needed, fully as much as to look after the individual plumber.

Public service companies usually notify each other of the time and place of contemplated work, and a line-walker may be given such notice and ordered to report whether the work is such as to call for a watcher. Here again, however, the human element comes in; and quite frequently a notice is not sent, or is delayed until after the work is begun, so that the line-walker sees the opening before the office knows of it. A telephone conduit was once laid on a Sunday, and notice to the gas company was forgotten. There being no line-walking on Sundays, the work was never seen, and therefore there was no opportunity to object to the resting of a conduit on a service, causing the latter to sag an inch, and to come out of the main a few months later. The resulting escape of gas filled the conduit; and when the mixture was ignited by a plumber's furnace, several hundred dollars' damage was done to the conduit and to neighbouring windows. If notice had been sent, a watcher would have been on the job, and the damage, as well as the resulting counterclaims between the two companies, would have been avoided.

The encroachment peril is not in itself so dangerous to a main system as the peril from subsidence and breaking due to deep excavations either close to or including a main. This comparative harmlessness of encroachment is no valid excuse for failure to protect the main system from it. The ordinary danger from excavation is due to sewer work; and either the line-walker or the watcher must see that the main is protected as well as possible from any chance of subsidence, either during the work or after its completion. If the main is outside the sheeting and the latter is to remain in, there is little to be done, and not much trouble is apt to result. If the main is in the excavation, or just outside, and the sheeting is to be taken out, then supports from the sewer crown or the spring of the arch should be put in—two under each length. This, coupled with the custom of never allowing pipes smaller than 4-inch to remain in use under such conditions, will generally prevent any trouble from broken mains after the excavation is refilled.

A peculiarly modern peril to a main system is that due to the construction of a street-car subway. Ordinarily such a subway is built by opening the street from above, and excavating nearly to the full depth in the open cut; then flooring is laid, and the rest of the work proceeds under cover. Thus an immense chamber is formed under the street, enclosing gas and water mains, telephone and electric light conduits, and any other structures that may have been in the street. Of course, any formation of an explosive mixture of gas and air is to be prevented by all means. The possibilities of such a mixture were disastrously shown in Boston several years ago.

If the gas-main uncovered in the subway is a very large one—say, over 12 inches in diameter—and especially if, by reason of a duplicate main, no services are supplied from the large main, the advisability of removing it from the excavation, and laying a temporary pipe on or above the ground, should be seriously considered. This practice was followed in New York city in at least one instance. If any main, of whatever size, is left under the flooring, then, besides a careful supervision of all supports as installed, a day-and-night patrol of the line should be maintained. Under each main should extend a platform so arranged that the inspector walking on it will be in a position to smell any leaks. Also, vent-holes should be made in the flooring, along the kerb line, and about 50 feet apart. Wooden chimneys, 2 feet square and 7 feet high, placed in these vent-holes remove any menace to pedestrians, and prevent cigar stumps, matches, &c., being dropped down.

Judging from experience, I think it safe to say that, in carrying out any system of protection as here outlined for subway work, all expense, except the pay of the necessary line-walkers, will be cheerfully met by the subway contractor, who is always keenly alive to the menace from gas-mains.

The second phase of the work to be done in reducing the chances of serious street explosions from leaks in mains—viz., the investigation of existing dangerous conditions—is of necessity limited, as already stated, to an examination of all manholes which do or may contain mains. The manhole company will usually send a representative to accompany the employees of the gas company on these trips of examination. Wherever a main is found, a sketch should be made of the conditions. The extent to which the removal of mains should be carried will depend upon many things, not the least important being whether the manhole company will pay all or any part of the expense. There will be many locations where an avoidance of all present manholes is an impossibility, and also many where a circuitous route would avoid these manholes, but not the new ones which are sure to be built in the near future.

The plan followed for a main system embracing 1300 miles and several thousand manholes has been to remove, where feasible, all mains 6 inches and less in diameter—carrying them round the manhole. Where allowed to remain in the manhole, the pipe, if smaller than 6-inch, was increased to this size; all existing lead joints were replaced by cement, or removed by the relaying of the pipe; the brickwork of the manhole walls was cut away from around the pipe for a clear space of about an inch, and the space filled with yarn and cement grout—the idea being to leave a water-tight wall, but to prevent any strain being transmitted to the pipe through the manhole wall.

The above programme has been carried through with comparatively little opposition from the manhole companies; and the proportion of the expense collected from them is satisfactory, considering previous local conditions. As a result of the line-walking system and manhole work, eight years have elapsed without any serious manhole explosions due to gas; and those that have occurred have generally been the unmistakable result of unnecessary interference with the gas-mains by one of the manhole companies—an interference which was protested against at the time, but which could not be entirely prevented.

THE COMBINATION OF HYDROGEN AND OXYGEN IN CONTACT WITH HOT SURFACES.

The researches of Dr. W. A. Bone, F.R.S., on the conditions of combination of gases and analogous subjects have frequently been reported in recent volumes of the "Journal;" and his latest work in this very difficult experimental field is eminently deserving of notice. He has been associated in this work with Mr. R. V. Wheeler, B.Sc., Dalton Scholar and Fellow of Manchester University. The following summary of the experimental results obtained by Dr. Bone and Mr. Wheeler has been prepared from a paper presented by them to the Royal Society, and recently published in the "Philosophical Transactions" of that body.

It has been proved by numerous observations that the velocity of a given reaction in a homogeneous system—*i.e.*, a solution—is determined by its order, in accordance with the principle of mass reaction; but it cannot be fairly assumed that the velocities of gaseous reactions are governed by the same data. Hitherto the catalytic action of the heated wall-surfaces of the containing vessels has not received the attention it deserves; and taking the surface-factor into account, a so-called homogeneous system is in many cases not properly homogeneous, and hence the law of mass reaction cannot be properly applied to it. It is necessary to consider *à priori* the factors which may determine the velocity of an irreversible gas reaction of the type $A + B = A B$ in a heterogeneous system; and from the kinetic standpoint, the observed rate of change will, in the absence of other disturbing factors, depend on (1) the actual rate of combination at the surface, (2) the rates at which A and B respectively diffuse inwards from the inert atmosphere outside on to the surface, and (3) the rate at which the product A B diffuses outwards. Nernst has recently advanced a diffusion theory which makes the velocity observed in the system dependent not on the "order" of the reaction, but on the diffusion factors only. This diffusion theory is proved, however, by the authors' experiments to be incapable of explaining the facts of the catalytic combination of hydrogen and oxygen, as other factors clearly are of influence.

Bodenstein, in 1899, concluded, from combustions of electrolytic gas in glazed porcelain tubes at 482° to 689° C., that the velocity of the reaction was governed by its "order" in accordance with the law of mass reaction. In 1903, he published results of experiments on the combination of hydrogen and oxygen in contact with a catalyzing surface of platinum at the ordinary temperature. When the surface was kept dry by maintaining it at a slightly higher temperature than the surrounding gas, the velocity constant increased rapidly as the pressure in the apparatus fell, or, in other words, the rate of combination did not even approximately conform to an equation of the first order. The authors aimed at measuring the velocities of catalytic gas reactions by the aid of a circulation apparatus, which admitted of the product being very quickly removed from the sphere of action, either by condensation or by solution in water or other absorbing liquid. The case of hydrogen and oxygen was selected for systematic study of the action of surface in inducing gaseous reactions; and a great variety of surfaces were employed in order to avoid possible restriction of view of the phenomena. The results, as a whole, leave no doubt that the catalytic process depends primarily on a condensation of one or other, and in some cases possibly both, of the reacting gases on the heated surface. Any purely chemical explanation, such as the theory of a rapidly alternating series of oxidations and reductions of the catalyzing material, seems quite inadmissible. It is also certain that the rate at which the gases combine over a given surface is governed neither by the "order" of the reaction nor by diffusion factors simply.

The catalyzing power of a new surface usually increases up to a steady maximum when successive charges of electrolytic gas are circulated over it. Thereafter the rate of steam formation is always directly proportional to the pressure, provided that the gases are present in their combining ratios, and the product is rapidly removed from the sphere of action—that is to say, the

velocity curve is always of a monomolecular type, once the surface has acquired its normal activity. This is true of all the surfaces examined. When one gas is in excess, the rate of combination is nearly proportional to the partial pressure of the hydrogen, which thus becomes the determining factor in any given experiment, though copper oxide and silver surfaces are somewhat exceptional in this case. Broadly, hydrogen plays an all-important part in the catalytic process; being rendered "active" by association with the surface. In the majority of cases, the hydrogen is merely "occluded;" but with silver, chemical combination is indicated by the formation of an unstable hydride at the surface. The catalyzing power of most of the surfaces examined could be stimulated, often greatly, by previous exposure to hydrogen at moderately high temperatures.

Recently MM. P. Sabatier and J. Senderens have shown that many metallic surfaces (and nickel in particular) render hydrogen "active" at comparatively low temperatures. Thus, on passing a mixture of hydrogen and an olefine over finely-divided and freshly-reduced nickel, a quantitative yield of the corresponding paraffin was obtained at 160° C. With benzene instead of the olefine, cyclo-hexane was produced, while nitrobenzene was directly reduced to aniline. Nitromethane was converted into methylamine at 150° to 180° C., and into methane and ammonia at 350° C. But still more remarkable, a mixture of one volume of carbon monoxide and three volumes of hydrogen was completely converted into methane and steam when passed over finely-divided nickel at 250° C.

As to the cause of the activity of hydrogen when it is condensed or occluded by metallic or other surfaces, opinions will differ. But it may possibly be connected with the increase in the rate of emission of negative corpuscles from a metal, which has been observed to occur by other investigators. The question, however, needs further investigation. The experiments with oxides are of special interest in that they show how inadequate a purely chemical view of the catalytic process is. In the case of copper oxide, the catalytic process involves the condensation of "active" oxygen at the surface, which is protected from the attacks of hydrogen by the film of condensed oxygen.

The apparatus employed by the authors for measuring the velocity of the catalytic combination of hydrogen and oxygen consisted essentially of a closed system in which the reacting gases were circulated at a uniform rate over the particular surface under investigation while maintained at a constant temperature, and subsequently through a cooling or absorption arrangement in which the resultant steam was rapidly removed. The rate of combination was measured by observing the pressure in the apparatus at regular intervals. A series of bye-pass sampling tubes permitted samples of the gases to be cut off if required for subsequent analysis without interfering with the pressure or the course of the reaction. [For details of the apparatus, the original paper must be consulted.] The electrolytic gas used was prepared by the electrolysis of a solution of highly purified barium hydroxide, as recommended by Brereton Baker. The hydrogen, when required for admixture, was prepared electrolytically from a solution of barium hydroxide, and oxygen by heating recrystallized potassium permanganate. The gas-furnace in which the combustion tube was heated to the desired temperature was supplied with gas through a Stott's governor, so that the temperature could be kept constant for many days.

The first sets of experiments were made on the surface presented by fragments of unglazed porous porcelain previously heated to 1000° C. in a muffle furnace, and perfectly white in colour. Broadly, it was found with this surface that (1) with normal electrolytic gas the rate of combination was always proportional to the pressure of the dry gas, (2) with an excess of either gas the rate of combination was always mainly, if not entirely, proportional to the partial pressure of the hydrogen, and (3) the catalyzing material occluded hydrogen, but not oxygen, at dull red heat. It was found, however, that the action of the porcelain was greatly affected by its past history, as, for instance, a surface which had been previously used for experiments on the slow combustion of acetylene at first displayed a peculiar susceptibility to the stimulating influence of oxygen.

It was made clear by the experiments on the porcelain surface that the rate of steam formation was governed neither by Bodenstein's "order" of the reaction, nor by Nernst's diffusion factors simply. Neither was the theory of a rapidly alternating series of oxidations and reductions of the catalyzing surface admissible. The evidence instead favours the view that the catalytic action of porcelain is primarily due to the condensation or occlusion of one, or possibly both, of the reacting gases on its surface. When one or other gas was in excess, the rate of combination was proportional to the partial pressure of the hydrogen; and the material absorbed hydrogen at a red heat. Occluded hydrogen therefore seems an all-important factor in the process. Under certain circumstances occluded oxygen would appear to exercise an accelerating influence on the process. Excess of hydrogen produced a continuous acceleration throughout an experiment; but excess of oxygen only during the initial stages. These facts lead to the view that porous porcelain occludes or condenses both hydrogen and oxygen at rates which depend to some extent upon the physical condition and past history of the surface; but that in general, whereas the process is extremely rapid, and the surface layer is soon saturated in the case of oxygen, the occlusion of hydrogen is slower, and the limit of saturation much higher. Combination occurs at, or but little faster than, the rate at which the film of occluded nitrogen is renewed, but considerably faster than at the rate of occlusion of hydrogen.

The second series of experiments was made, by way of comparison with the acidic porcelain, with the basic surface of calcined magnesite, containing less than 1 part of iron in 100,000. It was found with this surface that (1) with normal electrolytic gas, the rate of combination was proportional to the pressure of the dry gas, (2) with an excess of either gas, the rate was determined mainly by the partial pressure of the hydrogen, and (3) the catalyzing power was greatly stimulated by hydrogen, but diminished by oxygen. The catalytic action of this surface must be attributed to its power of occluding hydrogen.

The third series of experiments was made with silver gauze and silver foil. It was found that (1) with normal electrolytic gas, the rate of combination was proportional to the pressure of the dry gas, (2) the activity of the surface was always greatly stimulated by previous treatment with hydrogen, but not with oxygen, (3) an "active" surface absorbed hydrogen both at 400°C. and at dull red heat, and (4) the behaviour of the hydrogenized metal suggested the formation of a hydride rather than the mere occlusion or condensation of the gas. The catalytic action of the metal involves the rapid formation and oxidation of a hydride, or at least of a film of hydrogenized silver. Two independent velocities—viz., that of hydrogenation and that of the oxidation of the hydrogenized metal—come into play; and their relative values will depend in each case on the condition of the surface in respect of its power of combining with hydrogen.

The fourth series of experiments was made with gold gauze, the fifth with platinum gauze, and the sixth with nickel gauze. The catalytic action in all these cases appeared to be due primarily to an association of the surface with hydrogen. The rate of combination, with normal electrolytic gas, was proportional to the pressure of the gas. The activity of the surface could be stimulated by previous exposure to hydrogen at moderately high temperatures; but oxygen *per se* had no such accelerating, but rather a retarding, influence. With an excess of either gas, the rate of combination was nearly proportional to the partial pressure of the hydrogen.

The seventh series of experiments was made with three easily reducible oxides—viz., calcined spathic iron ore, nickel oxide, and copper oxide. In the case of the spathic iron ore and the nickel oxide, it was proved that: (1) The gases would combine quite rapidly without producing any permanent change in the catalyzing surface; (2) the rate of combination with normal electrolytic gas was always proportional to the pressure of the dry gas, and far exceeded the rate of reduction of the catalyzing surface by hydrogen, or its rate of re-oxidation by oxygen; and (3) when the gases were not present in combining proportions, the rate of combination was solely determined by the partial pressure of the hydrogen.

In the case of copper oxide, the catalytic process appeared to involve the condensation of a film of "active" oxygen on the surface; and this film protected the catalyzing oxide from the attacks of the hydrogen, which would otherwise have energetically reduced it. At low pressures the film became too thin to ensure complete protection, and consequently the formation of steam was accelerated by reason of hydrogen penetrating to the oxygen and reducing it. Accordingly, the rate of steam formation when the gases were not present in combining ratios was found to be proportional to the partial pressure of the oxygen. In the cases of the other oxides also, it is difficult to resist the conclusion that the catalytic action is primarily due to a physical condensation of one or other of the reacting gases at the surface. It would appear to be the hydrogen which is condensed and so rendered active, because in all experiments in which the gases were not present in combining ratios the rate of combination was always proportional to the partial pressure of the hydrogen.

New Catalogues.

We have received from Messrs. J. & W. B. Smith, of Farringdon Road, E.C., the supplement for the approaching season to their general catalogue. It consists of 60 large quarto pages showing a great variety of pendants, brackets, globes, shades, burners, and mantles for upright and inverted incandescent gas lighting. On p. 4 are illustrated the firm's patent "Radiant" incandescent burners and clusters, which can be used in nearly every form of lantern; and on p. 28, their "Silva" shadowless inverted cluster pendant, which is suitable for either domestic or business purposes. The assortment of brackets, pendants, and globes for inverted burners is large, and the designs are such as to suit all tastes. Altogether, the catalogue is well got up, and should prove useful to gas managers.

An excellently got up and convenient sized price list of tubes and fittings for gas, water, steam, hydraulic, and all engineering purposes, is being issued by Messrs. John Brotherton, Limited, of the Imperial Tube Works, Wolverhampton. The booklet contains illustrations, all descriptions of coils, joints, poles, and fittings, &c., and various useful tables are also included. Among these are the approximate standard weights and gauges of gas, water, and steam tubes; weights of wrought-iron plain tubes; weights and sizes of cast-iron spigot and faucet pipes; weights per foot of round iron; tables for the conversion of inches and feet into centimetres and metres, and *vice versa;* and a table showing equivalents of tenths of a millimetre with decimals of an inch.

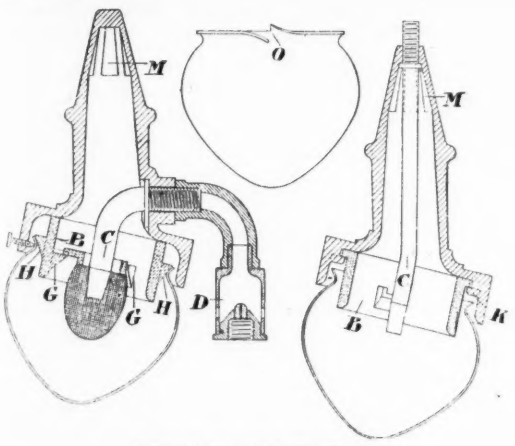
REGISTER OF PATENTS.

Inverted Incandescent Gas-Burner.

WILSON, ALEXANDER, of Glasgow.

No. 23,536; Nov. 16, 1905.

The patentee points out that, by the arrangement he describes, there is a top or outer casing or chimney with an inner ring or short chimney, with the mantle-carrier so disposed that the ingoing air will be heated in its passage into the lamp; and the mantle can be easily fixed in, or removed from, the lamp.



Wilson's Inverted Gas-Burner.

Within the outer casing of the lamp, is the ring or short chimney B, with mantle-carrier. C is the bunsen pipe, entering the casing either from the side or top. D is the mixing-chamber of the burner. The air to support combustion has to pass up between the outer casing and the globe F; and then down between the globe and the ring B into the body of the globe—the several parts of the lamp being kept at a high temperature by the combustion of the gas. The air on its passage into the globe is heated before it comes into contact with the gas, "thus making the flame hotter, and the incandescence of the mantle greater." The products of combustion pass up the inside of the ring B and the casing, and out from the openings M at the top.

The ring B may be made with projections H to rest on the rim of the globe, or it may be carried by snugs fixed on the outer casing, as at K in the second arrangement shown. In the latter case, the ring B is made with a projecting part—spaces being left in it to allow the snugs K to pass; and on the ring being rotated in its position, it is fixed and held up as in a bayonet joint. The projections G on the inside of the ring are for supporting the mantle.

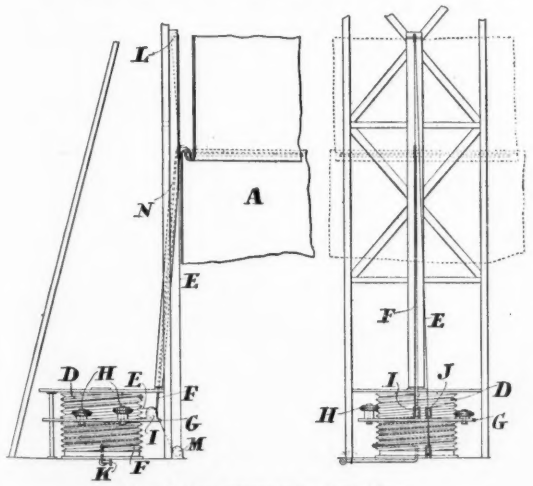
The globe is made with portions of the rim turned upwards or downwards, forming spaces as at O, so that the globe can be placed in, or taken out of, the lamp by being rotated in a similar manner to the ring with the mantle-carrier B, and as in a bayonet joint.

Anti-Freezing Devices for Gasholders.

ROOK, G. E., of Wood Green, N.

No. 23,735; Nov. 17, 1905.

This invention relates to anti-freezing devices for gasholders of the kind in which the flexible tube supplying steam to the water cup of the holder is wound and unwound on a drum-like body according to the movements of the holder. It "consists more particularly in improvements in the drum, a protector or shield for employing the pipe for more than one cup when necessary, the pipe and a framework for the drum, and for leading the flexible pipe on to the same."



Rook's Anti-Freezer for Gasholders.

In the illustration is shown a gasholder, having the usual framework and with one cup. D represents a drum having one-way grooves made in it for the cable E and the flexible pipe F. The drum is mounted on a framework, the movable part G of which carries rollers H, or their equivalents, which travel in the grooves on the drum. The pulley I is also mounted on G, and leads the tube F on to the drum. A second pulley J serves for a like purpose for the cable E. The steam enters the pipe K below the drum, and passes through the pipe F, round and up the side of the holder, to the cup. The pipe is preferably non-flexible, and is extended in two directions, each a quarter of the way round the cup. The ends of the pipes being open, allow the steam to blow off into the water. If other cups are formed on the holder, the steam-pipe is fitted from one cup to another by any suitable means.

The cable E is shown attached to the holder near the cup. This cable passes over the pulley L and down to J, and round the drum down to the pulley M, and up again to the fixed point. N is a weather shield for the steam-pipe. The whole of the apparatus can be enclosed, and the movement of the holder will so draw on the cable E as to cause it to rotate the drum and wind or unwind the flexible pipe as required.

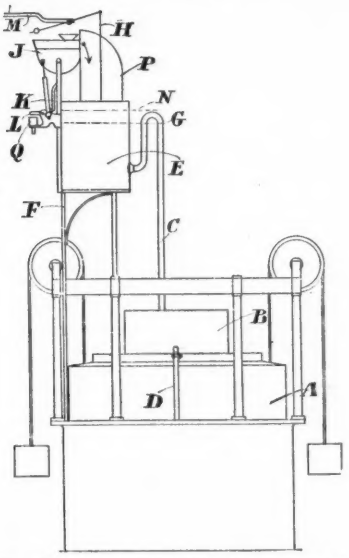
Temporarily Increasing Pressure in Gas-Mains.

CHANDLER, F. A., of Leamington, BONNIKSEN, B., of Coventry, and BERRIDGE, T., of Leamington.

No. 9250; April 19, 1906.

This automatic apparatus for temporarily increasing the pressure of gas in mains is adapted chiefly for use in connection with electrically synchronized clocks employing mechanism such as that described in patent No. 21,795 of 1905, and for use in conjunction with automatic lighting and extinguishing apparatus as described in patent No. 4377 of 1906.

In the apparatus described in the earlier patents, increase of pressure in the mains is employed to close an electric circuit to effect synchronization. But, according to this invention, the bell of the gas-governor carries a tank, to which water is added automatically to increase the pressure on the governor when desired. Above the tank on the bell is a second tank, which is normally nearly full of water, adapted to syphon off from the top tank into that on the governor bell. Normally there is insufficient water in the top tank to start the syphoning; but the extra water is admitted automatically at the right time from a tippling tank, which raises the level in the syphoning tank and causes it all to pass off to the governor bell and raise the pressure.



Chandler, Bonniksen, and Berridge's Pressure Increaser.

The preferred form of apparatus for carrying out the invention is shown in the engraving. Here, the pressure in the mains is determined by the gas-governor bell A, as usual. This has at its top a tank B, adapted to contain water admitted for increasing the pressure, and provided with two inlet pipes C and one outlet pipe D. [As the pipes C lie side by side, only one is shown.] The inlet to the tank B is, therefore, double that of the outlet D. The pipes C are formed as syphons leading from an upper tank E supported on a suitable framework F. The tank E normally contains water up to (say) the level G; this being effected by the automatic ball-cock device H. Above the syphoning tank E is a tippling tank J. This is pivoted slightly to one side, so that it has a tendency to fall down in the direction of the arrow. The tippling tank carries a leg K, which normally engages a rocker L, which can be turned about its pivot so as to free itself from the leg and allow the tippling tank to overbalance.

When the ball-cock is opened, water arriving by the pipe M falls first into the tippling tank J and then overflows into the syphoning tank E. The effect of the upsetting of the tippling tank is to raise the level to that shown in the dotted line G to a height represented by the line N. This starts the syphoning, which draws off all the water from the tank E and adds it to the tank B; some flowing off from the tank B by the pipe D all the time. As the inlet pipes C are double the capacity of the outlet pipe D, the result is to approximately fill the tank B and allow it to draw off as soon as the supply from the tank E ceases.

The tippling tank J is so pivoted that, when empty, its centre of gravity is below its pivot, so that it rights itself automatically. A

pneumatic check is also provided to prevent it acting too rapidly; and a stop, so that it shall not strike the edge of the tank E.

Adjacent to the arm L is arranged the magnetic device Q, which repels the end of the rocker L. At the right moment an electric circuit is closed—as, for instance, by a master clock—when the device Q is energized to repel the end of the rocker L. This frees the leg K and allows the tippling tank to upset, which (as described) automatically raises the pressure in the main. After the water has passed off from the tank E, the ball-cock H admits further water, which first of all fills the tank J and then overflows to fill the tank E.

Gasifying Raw Materials in Vertical Retorts.

HOERING, P., and WIELANDT, W., of Berlin.

No. 2245; Jan. 29, 1906.

This invention relates to the gasifying of raw combustible materials containing large quantities of water; the object being "to produce a pure and uniform generator gas," by first partially coking or distilling the material in a suitable retort and then completely gasifying in a generator filled periodically therefrom. The retort is arranged over (or approximately over) the generator, and is separated from it by a valve placed in a cooled part of the connecting passage—air being supplied to the generator in any convenient manner.

It is essential, the patentees remark, that the coke should not pass out of the retort into the generator in a glowing or hot state, in which case the separating valve would have to withstand high temperatures, but that the coke, partially freed from the gases, should be cooled down before passing through the connecting-passage to the generator, whereby "complete use is made of the heat thus liberated for the process." This may be attained in different ways.

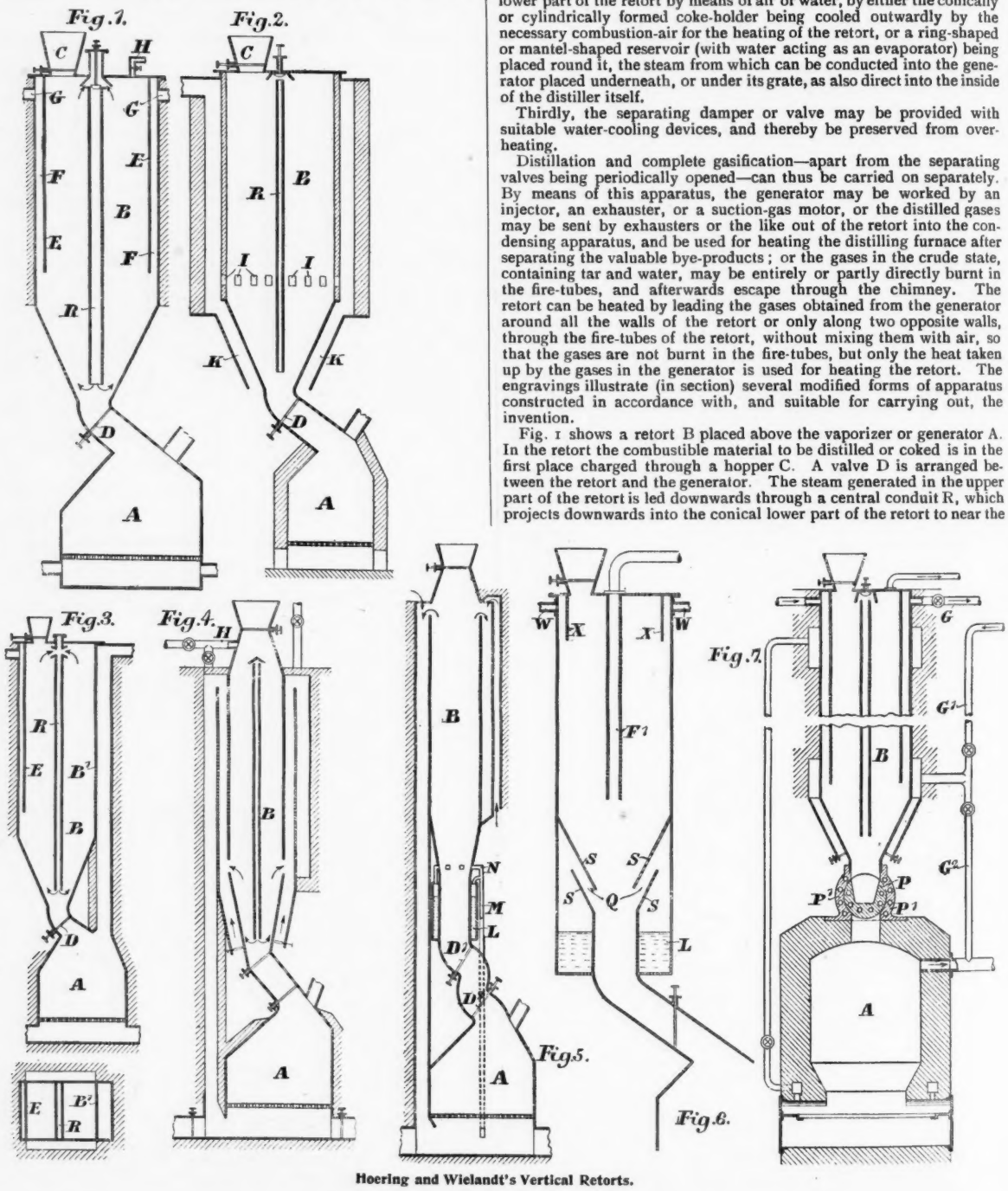
First, the large quantities of steam generated in the upper part of the retort in the drying zone may be compelled to descend into the lowest part of the distiller; to blow through and to cool the partially gas-freed coke; and then to pass out of the retort together with the remaining gases freed by distillation. This may be effected by building a connecting conduit (open at both ends) or a chamber between the uppermost and lowest parts of the retort, and arranging the gas-delivery opening in the coking zone of the retort underneath its centre. On account of the natural pressure conditions, the steam developed in the drying zone is then caused to make its way through the connecting conduit, and through the coke to be cooled, to the gas-exhaust opening.

Secondly, the cooling down of the coke freed from gas may be effected, or eventually aided, by means of outward cooling of the bottom or lower part of the retort by means of air or water, by either the conically or cylindrically formed coke-holder being cooled outwardly by the necessary combustion-air for the heating of the retort, or a ring-shaped or mantel-shaped reservoir (with water acting as an evaporator) being placed round it, the steam from which can be conducted into the generator placed underneath, or under its grate, as also direct into the inside of the distiller itself.

Thirdly, the separating damper or valve may be provided with suitable water-cooling devices, and thereby be preserved from overheating.

Distillation and complete gasification—apart from the separating valves being periodically opened—can thus be carried on separately. By means of this apparatus, the generator may be worked by an injector, an exhauster, or a suction-gas motor, or the distilled gases may be sent by exhausters or the like out of the retort into the condensing apparatus, and be used for heating the distilling furnace after separating the valuable bye-products; or the gases in the crude state, containing tar and water, may be entirely or partly directly burnt in the fire-tubes, and afterwards escape through the chimney. The retort can be heated by leading the gases obtained from the generator around all the walls of the retort or only along two opposite walls, through the fire-tubes of the retort, without mixing them with air, so that the gases are not burnt in the fire-tubes, but only the heat taken up by the gases in the generator is used for heating the retort. The engravings illustrate (in section) several modified forms of apparatus constructed in accordance with, and suitable for carrying out, the invention.

Fig. 1 shows a retort B placed above the vaporizer or generator A. In the retort the combustible material to be distilled or coked is in the first place charged through a hopper C. A valve D is arranged between the retort and the generator. The steam generated in the upper part of the retort is led downwards through a central conduit R, which projects downwards into the conical lower part of the retort to near the valve, and is then compelled to pass through the glowing coke, already freed from gas, on the way to the channels F, partitioned off by the separating-walls E. The steam takes the heat contained in the coke from it, and gives it partly again in the channels through the separating-wall to the contents of the retort. The tar-vapour and gases which develop in the central part of the retort go direct to the channels F, and unite there with the steam decomposed in the glowing coke. The gases or steam escaping or sucked through the channels G are led to a



Hoering and Wielandt's Vertical Retorts.

condenser; and the residue, which is not capable of being condensed further, is finally employed for the outside heating of the retort. In order that too much steam may not pass into the lower part of the retort or into the coke, a part of the steam may (if necessary) be conducted through a pipe H direct to the condenser.

Fig. 2 shows a form of apparatus in which the steam which has passed through the central conduit R into the coke layer to be cooled, together with tar-vapour and gases generated in the middle of the retort, are conducted through the openings I directly to the channels or fire-tubes surrounding the retort and there directly burnt. The air necessary for the combustion of the retort gases is supplied through a hollow mantel or channels K, which surround the funnel-shaped lower part of the retort. The heat radiating from this part is thus made useful for the previous warming of the air.

Fig. 3 shows a form of apparatus differing essentially from that already described, by reason of the fact that the heat contained in the generator gas is employed for heating the one narrow retort-wall B^1; while on the opposite narrow side of the retort the heat of the hot distilled gases is transmitted through the separating wall E to the retort contents again, and both the longitudinal sides are heated by the burning of hot gas. Under some circumstances the heat of the generator gases alone suffices for the outside heating of the retort, so that the distilled gases of the retort are no longer necessary for heating, and can be directly passed unburnt into the generator.

Fig. 4 shows a form of apparatus in which the gases and steam escaping from the retort, after they have been burnt in the fire-tubes surrounding the retort, are passed, with a supply of further quantities of air, under the grate of the generator A, in order to be converted in this to generator gas. A part of the steam out of the retort may escape directly to the condenser through the pipe H, which is connected to the upper end of the retort, or (with the respective taps shut and open) be mixed with the smoke-gases and passed together to the generator. A chimney is shown through which the smoke-gases of the fire-tubes may be allowed to escape direct into the open air.

Fig. 5 shows a form of apparatus in which an evaporator or water-jacket L is arranged round the lower part of the retort in order to cool the coke before it comes in contact with the slides D^1 D^2. The generated steam is either passed through the pipe M under the grate of the generator, or through the pipe N into the interior of the retort. The gases escaping from the retort (mixed with previously heated air) are brought into the fire-tubes for combustion, and then passed downwards under the grate of the generator. The heat radiating outwards from the fire-tubes is utilized for heating the air for combustion.

Fig. 6 shows another arrangement of apparatus in which the evaporator L is in direct connection with the space containing the coke through openings or channels Q, which are formed between walls E projecting, like the laths of a venetian blind, into the place where distilling takes place. This form of construction differs from that above mentioned, in that no downcast pipe is provided for the steam, and a deep gas-exhaust conduit or pipe F_1 is placed centrally, while the upper steam-exhausts W are arranged behind separating-walls X.

Fig. 7 shows a further form of apparatus in which a chamber-tap P is arranged between the retort and the generator. This is surrounded by a water-cooled jacket P_1, and is itself also suitably cooled with water. A tight-fitting joint is thereby obtained; and the coke is further cooled before it arrives in the generator. As shown in this illustration, the gases sucked from the retort are in the first place passed through a pipe G to the condenser, and led back, through a pipe G_1, to the fire-tubes of the retort for the purpose of combustion. The smoke-gases are sucked into the generator. Where the distilled gases do not suffice for a sufficient heating of the retort, a branch conduit or pipe G^2 may be led from the generator-gas conduit to the conduit G_1, which passes the generator gas into the fire-tubes.

APPLICATIONS FOR LETTERS PATENT.

20,561.—SMITH, T. B., and SUNLIGHT AND SAFETY LAMP COMPANY, LTD., "Downwardly burning gas-lamps." Sept. 17.

20,590.—ZIRNSTEIN, W. A., "Suspending gas-lamps." Sept. 17.

20,607.—GODWARD, E. R., "Anti-vibrator." Sept. 17.

20,630.—REID, R., "Generating gas from liquid hydrocarbons." Sept. 15.

20,643.—WOUWERMANS, P. VON, and GASSPAR-UNTERNEHMUNG NACH SYSTEM WOUWERMANS, HALBMAYR, AND CO., "High-pressure and other bunsen burners." Sept. 17.

20,734.—KRUEL, F., "Gas bath-heaters." Sept. 18.

20,774.—WALDRON, F. B., "Fluid-pressure governor." Sept. 19.

20,789.—SHAW, E. J., "Adjustable pendants." Sept. 19.

20,846.—GOODSON, J., "Gas-governors." Sept. 19.

20,940.—MANNIN, C., "Acetylene generator." Sept. 21.

20,950.—MITTON, A. E., "Gas-lamps." Sept. 21.

20,955.—DESELLE, C., "Regenerative furnaces." Sept. 21.

20,986.—BRAMLEY-MOORE, S., "Liquid meters." Sept. 21.

20,993.—THOMPSON, W. P., "Gas brackets and pendants." (A communication from Ahrendt and Co.) Sept. 21

21,022.—BOUVIER, A., and COLLON, E., "Mixing, measuring, and carburetting gaseous bodies." Sept. 21.

21,024.—DOW, J. S., "Photometer." Sept. 22.

21,046.—STEPHENSON, F., "Water-valve for gas-producers." Sept. 22.

21,063.—SEYBOTH, F. W., and BAUMANN, E. K. A., "Gas-turbines." Sept. 22.

Henley Town Council and the Gas Company.—Formal notice having been received from the Gas Company of their intention to offer for sale by auction £2000 of new ordinary 7 per cent. stock, Mr. Watts moved that the Lighting Committee of the Henley Town Council should go fully into the question of whether it was desirable for the Council to purchase stock in the Gas Company, in order to get a controlling influence in the undertaking. They could, he said, borrow the money at 3½ per cent., and get 4 per cent. back. The motion was unanimously agreed to.

CORRESPONDENCE.

[We are not responsible for the opinions expressed by Correspondents.]

Blending Producer Gas with Coal Gas.

SIR,—Following up the intimation you made on my behalf last week, I now ask for space for a few paragraphs, wherein to treat Dr. Colman's article in your issue of Sept. 18, as well as the criticism of my commendation of Mr. Shadbolt's process.

In my address to the Irish Association, the reference therein to Mr. Shadbolt's process was a mere preliminary to discussing the actual commercial effect to the average consumer of a lowering of the grade of gas supplied to him, and his rights in the matter; and I clearly indicated that my mind was open as to the merits of the system itself, by saying we were only experimenting. Had not my hand been forced, I should have preferred waiting till we had had more experience in dealing with blended gas before describing at all what considerations warranted our embarking on the experiments.

On reading Mr. Shadbolt's account of what he was doing, my first impulse was to condemn it—feeling, with you, that it was an economic fallacy, because it was manifest that the saving in the cost of the gas could not warrant a reduction in the selling price proportionate to the reduction in calorific value. Reflecting, however, that Mr. Shadbolt was a man of considerable practical experience, I felt he could hardly have been carrying out in actual practice what appeared to be so serious a blunder without having quickly found it out; and remembering Professor Smithells' 1905 Gas Institution lecture on Flame Temperature, Mr. J. H. Brown's paper on Low-Grade Gas, and Mr. A. F. Browne's remarks thereon, I roughed out a few calculations, from data that I had available, and satisfied myself that the process was worth a trial before being condemned. The large proportion of inert gases caused me to pause and think well what I was doing; but the more I thought about these inert gases, the less they troubled me. Nevertheless, they compelled me to weigh well the merits of blue water gas as a diluent preferable to producer gas, as off-hand one could not help feeling that an entirely combustible gas was preferable to one more than half inert.

Proceeding with my calculations, I satisfied myself that in the small works with which I was connected the B.Th.U. in water gas were (after allowing for interest on capital) too costly to warrant its use as a diluent; and even in a large works, I question, even now, if blue water gas can be produced with cheap enough B.Th.U.'s to compete with producer gas. The question then recurred whether the consumer was equitably entitled to a reduction in price proportionate to the drop in B.Th.U.'s; and considering what the average consumer did with the gas when he got it, I concluded that, while he would undoubtedly gain to the full any reduction of price, it was doubtful in the extreme whether he would burn any more gas at all—provided, of course, the degradation was not carried too far.

In my address, I explained how we arrived at the percentage that we were introducing; and I may say the analyses indicate that we have introduced as much as about 10 per cent. without any apparent reduction in the illuminating effect upon an incandescent burner, and while still affording a good light by a flat flame.

Now, it is the presence of inert gases in the producer gas which causes it to be condemned; and, rightly or wrongly, I think far too much importance has been attached to them.

Professor V. B. Lewes, in his Society of Arts lecture in 1902, commenting on the Crystal Palace experiments, condemned producer gas, without, unfortunately, giving us any calculations as to its effect. In his article now before us, Dr. Colman stops his calculations when he commences to deal with the inert gases; and he will, I feel sure, agree with me that he has unwittingly conveyed a very false impression when he—referring to flame temperature—talks of our having raised the quantity of nitrogen to "practically double," so conveying the impression that, with the blend under consideration, one not only lowers the calorific value, but also doubles the volume of inert gases to be heated up to flame temperature by the reduced number of B.Th.U.'s When referring to flame temperature, you cease to deal with the original constitution of the gas, and have to calculate from the total products of combustion, which are all inert. Now, gas requires six times its volume of air to consume it; and if an extra 5 per cent. of nitrogen is mixed with the original gas, it forms considerably less than 1 per cent. of the final products to be heated up to flame temperature, which temperature will consequently only be decreased by something less than 1 per cent. by the presence of the extra nitrogen. It must be borne in mind, too, that the presence of inert gases decreases the "six volumes" of air referred to above; and it is quite conceivable that a mixture of carbonic oxide and nitrogen could have a much higher flame temperature than an entirely combustible hydrocarbon. For instance, as Mr. A. F. Browne pointed out, in his remarks upon Mr. J. H. Brown's 1905 Gas Institution paper, a light carburetted hydrogen, with a calorific value three times as much as carbonic oxide, nevertheless had a flame temperature 20 per cent. less, which is due to the light carburetted hydrogen requiring 2 volumes of air to burn it, whereas carbonic oxide needs only ½ volume. Furthermore, when speaking of flame temperature are we not forgetting the question of dissociation? Professor Smithells, in his lecture already referred to, explained how actual flame temperatures were so much less than the potential; and is it not conceivable that the actual flame temperatures from blended and unblended gas may be the same—both somewhere short of the temperature of dissociation? The calculations of flame temperatures are somewhat laborious to an engineer not constantly dealing with them; but doubtless Dr. Colman, having his data immediately to hand, would favour those interested in this question—and I know there are many—by carrying his calculations further, and state quantitatively the effect of the inert gases mentioned in the example he took upon its flame temperature.

In experimentally arriving at the calorific value of the gas, the presence of inert gases affects the result by spreading the units over more cubic feet. This calorific value is used to calculate the flame temperature; and to vaguely refer to their effect again is taking them into

account a second time, as, having reduced the calorific value, their further effect on the flame temperature due to specific heat is almost negligible.

So much for calorific intensity, which affects the luminosity of our incandescent mantles. We have other uses of gas to consider, as pointed out by Dr. Colman. Mr. Brown, in his paper cited above, gave some interesting figures as to the greater efficiency of B.Th.U.'s in water gas than in coal gas. In one experiment, he states that a gas-engine did the same work with 240 water-gas B.Th.U. as it did with 285 coal-gas B.Th.U.; an increase in efficiency of 19 per cent. In another example, he shows the B.Th.U.'s in Mond gas 17 per cent. more efficient than those in coal gas. These are very considerable differences of efficiency when calorific values are widely different, and point to some calorific value less than that of coal gas being most suited to the present design of engine. Mr. Brown's results were taken from engines carefully regulated; but in the case of the ordinary engine, the lack of scientific supervision will tell most on the high-grade gas where there is more room for it to act. These figures of Mr. Brown's seemed to have been overlooked in the discussion; but they are well worth consideration.

My point, however, was not so much the merits of any particular system, as the consumer's position in the matter. Dr. Colman says it must be shown that, under practical conditions, the consumer obtains as much or more heat, light, or power for the same amount of money as formerly. I would agree with Dr. Colman if he would paraphrase his demands to read that, under practical conditions, the consumer shall obtain equal or greater satisfaction of his requirements in the way of heat, light, or power for the same amount of money as formerly. The loss to gas-engine users of having their hands idle because the gas-engine is sooted up would make them eager to have a thinner gas supplied to them, which would make their engines run more reliably. It is not merely cost of gas which affects engine-users.

Down to some unascertained limit, incandescent burners give less trouble as you degrade the gas. In many other directions the consumer with low-grade gas has benefits in saving of labour and greater reliability which fully compensate him for lessened thermal value. My main argument, however, is that, provided you don't go below a certain limit of calorific value and flame temperature, the consumer wants a low-priced gas irrespective of quality, and wants it for the reasons suggested in my address. Acetylene has a calorific value about 2½ times as great as coal gas. Would it be seriously suggested that consumers would be better off with acetylene at 6s. 3d. than with coal gas at 2s. 6d.? The unsatisfactory divisibility of electric arc, acetylene, and now even incandescent gas lighting, prejudices their use—more light having to be used than required; and there is scope for a degraded gas which won't force a consumer to produce more light than he wants, and will enable him to get as much as he does require for less money.

Reverting for a moment to inert gases. The adoption of the air process of revivification, and the abandonment of lime purification, result in the admixture (respectively retention) of inert nitrogen and carbonic acid aggregating to about half the inert gases introduced by blending in the example suggested by Dr. Colman. The saving in cost of purification so obtained would not admit of a *pro ratâ* reduction in the selling price, yet any outcry against defrauding the consumer by measuring out to him gas so thinned with nitrogen and carbonic acid quickly subsided; and I believe the outcry against the Shadbolt process of blending, which is merely two or three strides more in the same direction, will in due course subside as we get more familiar with it, as I think there is indication we shall. Several who have water-gas plants in large works are already blending freely; and when they realize that B.Th.U. in coal or blue water gas cost about three times as much as they do in producer gas, and that the 60 per cent. of nitrogen in producer gas is reduced to 5 per cent. in the blend, and again, to under 1 per cent. of final products of combustion, I prophesy they will experiment as I am doing.

R. Bruce Anderson.

5, *Westminster Chambers, S.W.*,
Sept. 27, 1906.

A Combination Gasholder Valve.

Sir,—I have two holders worked by two valves only—one on their inlets and the other on their outlets, which allows either one or both to be on for filling or discharging at will. But now a third holder is required, and a similar arrangement of one valve filling or discharging is desired—that is to say, working with any single one of Nos. 1, 2, and 3, also in combinations of No. 1 with No. 2, No. 2 with No. 3, and No. 1 with No. 3, or all at once, at will. Is there such a valve now on the market?

Combination.

The Exhibition at Limerick.

Sir,—In reply to the letter of Mr. H. Hawkins in your last issue, I did not place any stigma on the Munster-Connaught Exhibition; and I fail to see how anybody reading my letter in the preceding number can say I did. What I said (and I say it again) was that the gas industry is inadequately represented at it in comparison with the other lighting industries—electricity and acetylene; and Mr. Hawkins's letter proves this. I am sure you will agree with me that half-a-dozen Welsbach incandescent "C" burners with plain chimneys and no globes, and with mantles fixed on the 9th of July last, can hardly be termed up-to-date incandescent gas lighting, even if "the same six mantles are still to be seen in use, and in perfect order."

Mr. Hawkins states that the exhibition is "not a gas exhibition, but an exhibition of purely Irish industries." Well, you would imagine gas made in Limerick was as much entitled to the term "Irish manufacture" as electricity or acetylene generated there. Perhaps the reason for electricity being given the preference in the lighting of the exhibition was the City Electrical Engineer offering his services free to the Exhibition Committee. As an Irishman, I protest against Mr. Hawkins's remarks that "the exhibition is purely a private venture of a few enterprising gentlemen in the city;" and I refer anybody interested in the matter to the official guide-book and catalogue, where he will find that every county in Munster and Connaught is represented on the Committee by some of their leading inhabitants.

I also find, on referring to the catalogue of exhibits, that the Whitehaven Colliery Company, of Whitehaven, have an exhibit; and it is one of the first a visitor will notice on entering the exhibition. I should like to know from Mr. Hawkins why an English Colliery Company were allowed to exhibit, while "several very noted makers of gas fittings, meters, lamps, and engines were refused on account of their goods not being manufactured in Ireland." At the Whitehaven Company's stand, coke is exhibited; and I did not see any exhibit of coke by the Limerick Gas Department. I should also like to know if the department were refused permission to light the exhibition on the same terms as those on which it is at the present time lighted by electricity and acetylene.

Sept. 28, 1906. An Irish Gas Manager.

Mr. Brearley and the Manchester Exhibition.

Sir,—Your luminous comments on my letter, or rather, I should say, on my own personal shortcomings, ought, I presume, to have effectually "extinguished" me. One can conjure up visions of the editorial fury which prompted you to deflect the discussion from the subject to the individual—visions in which the Editor, describing half-a-circle in his revolving chair, exclaims to his amanuensis, like a Monarch of the Mediæval Ages to his faithful henchmen, "Off with his luckless head." One cannot carry the analogy any further; for decapitation in those days was—happily for the victim—a short, if sorry business; whereas, even after the drawn-out slashing in your last issue, I am not yet controversially dead. Let me, however, crave another week in which to frame my reply. I have been so busy this week trying to memorize the contents of your last issue (lest I should be accused of being behind the times in the news of the gas industry), that I have had no time left to deal more fully with your comments in time for insertion in the present issue.

Longwood, Sept. 29, 1906. Jno. Hy. Brearley.

[We shall await, with peculiar interest, the further letter promised by the author of the above.—Ed. J.G.L.]

Engineering and the Workman.

Sir,—In your leader last week, you deal with a subject generally considered unsuitable for discussion in a technical paper; but as it has for its object the stimulating of manufacturers to effect a decided check to Socialism, it ought to form a precedent and be largely adopted by other papers in every trade. We have too long allowed the interested leaders of this movement exclusive access to the untrained intellects of the horde forming their following.

There are three kinds of Socialism: First, that defined by the words—a community of interests for the betterment of their own particular class. The second, as practised by the leaders, might be termed "Selfism." The last is true "Socialism," or a community of interests for the betterment of society, irrespective of class.

What is required, then, is to counteract the efforts of the misguided leaders of "Socialism," by the dissemination of true ideas as to what constitutes true progress towards the universal good of mankind. And this should be done, in and out of season, by means of literature in every shape and form.

Just consider again for one moment the creed of the Socialist as expressed in the quotation you give, which I venture to repeat: "That the unemployed partly owe their position to Science, with all other easy methods of production, being used to benefit the few against the interests of the many."

I know the working man of the type to which these remarks are addressed, and am aware that the doctrine will be accepted as gospel; and yet could greater twaddle be uttered? It is, however, this kind of talk which leads to strikes and unuttered signs of discontent among the labouring classes. It hampers the masters to the detriment of the general public (which, of course, includes the aforesaid labouring classes).

As "Socialism" would seek to put a drag on the progress of the perpetually moving wheel of Science, so likewise, if allowed a free hand, it would strive to strangle Individualism, and make human beings undistinguishably alike. It might as well try to make all men wear the same sized hats or boots.

It seems redundant to point out to even the followers of "Socialism" that it is only by Science that we in this isolated water-bound country can live in affluence as we do—enjoying the luxuries of other countries, but by familiarity esteeming them only as naturally within our reach. It is an axiom to say that Science and Progress by Invention cannot benefit one class to the exclusion of another. For instance, the invention of the refrigerator has done enormous good to the lower classes by giving them cheap and good meat, and other things which are exotics and which otherwise would not be within their reach, but might be procurable to the select few.

Again, where would the working man find his cheap white bread but for the inventive genius of individuals. Our country contains 43 millions of people, and it could not grow enough corn to feed them and at the same time leave sufficient men to maintain the commercial prosperity for which we are noted. We therefore have to seek elsewhere; and even in favourable climates the production would not be feasible unless it had been rendered possible by those "easy" methods so decried by the "Socialists."

Is it not apparent that the seed could not be sown, nor the harvest reaped in time, unless by the mechanical means now in use? So likewise but for speedy transit by rail and sea, and rapid handling by automatic appliances at docks and in mills, the corn could not be got ready for the oven in the required time, and at the low price which obtains at present.

Here one sees that it is the general public who benefit, not only by the procuring of cheap food, but in addition by the employment of millions of men in raising, deporting, and distributing the products of industry.

As it affects the gas trade (which gives the light to enable men to work in comfort, and to illuminate the streets to let them walk in security), where should we find ourselves but for the individual genius

of men like Murdoch, &c. We all know the devil works in darkness. Well, the present-day ideas of Socialists, by stifling Science and Invention, would plunge us into physical and intellectual darkness; and at the same time they would have prevented millions of men from working in the gas and allied trades.

As Steele puts it, "What a wretched and apostate state is this! to be offended with excellence, and to hate a man because we approve him."

63, *Rectory Road, N., Sept.* 27, 1906. ARCH. S. B. LITTLE.

Gas Explosion at Newbury.—There was a severe gas explosion on Monday afternoon of last week at the Newbury Electricity Works; but fortunately, though several men had narrow escapes, no one was hurt. An auxiliary gas-making plant had recently been erected at the works; and a trial took place on the preceding Saturday, when everything appeared to work in a satisfactory manner. On Monday, however, when further tests were about to be made, it was found that the holder, which is 15 feet in diameter, would not descend—possibly through being jammed by some obstruction. In fixing up the tackle required to rectify the defect, it is considered probable that it canted to one side, and that air was thus allowed to mix with the gas. Later on a back-fire from the engine may have ignited the gas. In the resultant explosion the holder was wrecked.

The Water Areas of Wales.—The Glamorgan County Council had submitted to them at their last meeting an important report of the Water Committee, who declared it to be advisable that steps should be taken to put in operation the powers granted by the Glamorgan and South Wales Water Act. They stated that they had resolved that a Solicitor should be employed to make a summary of the powers and obligations of the several Water Acts of the boroughs, district councils, or water companies authorized to supply any part of the county; that the selection of such Solicitor should be left to the Chairman and Clerk; that the County Medical Officer should be instructed to obtain statistics of the quantity and quality of the existing supplies of water and of the probable deficiency of such existing sources for the growing population; and that a conference should be held of all the district councils in the county, together with the Councils of Cardiff and Swansea, to consider the best means of utilizing existing sources of supply and obtaining others. The conference is to be held at Neath next Monday.

Haltwhistle Water Supply.—At the meeting of the Haltwhistle Parish Council on Monday last week, consideration was given to the report and estimate of Mr. J. E. Parker, Assoc.M.Inst.C.E., as to the proposed water supply for the north side of the town. The source is the Cow Gap springs; the population to be provided for is 400; the estimated consumption per head is 15 gallons a day, giving a required supply of 6000 gallons. There is an ample margin; the average yield of the springs being 22,000 gallons a day. A service reservoir of 12,000 gallons capacity is to be constructed near Shields-on-the-Wall, and the water then taken to various points in 3-inch service-pipes. The branches are intended to be put in at the owners' expense. The estimated cost of impounding the water, building the reservoir, and putting in the mains, &c., is £1376. In this figure nothing is allowed for wayleave or engineer's fees; but the cost of the scheme is expected to come well within £2000. After considerable discussion, it was agreed to recommend the scheme to the favourable consideration of the Rural District Council.

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MISCELLANEOUS NEWS.

NOTTINGHAM CORPORATION GAS UNDERTAKING.

Special Committee's Report—Proposed Important Re-Arrangements.

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The Gas Investigation Committee beg to report that they have had many sittings, and have taken much evidence, to which they have given their most serious and anxious consideration. They have come to the following conclusions:—

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2.—That it is not desirable for one official to undertake the entire management of the gas undertaking.

3.—They therefore advise that the administration of the gas undertaking should be reorganized in the following manner:

That an Engineer having practical experience in gas manufacture and a thorough knowledge of mechanical engineering should be appointed to have charge of the whole of the manufacturing stations and the plant used therein, and should be responsible for the manufacture of gas and for the carbonizing results up to the point where gas is delivered into the charge of the Distribution Department. This official should be required to work in harmony with the Manager, but should have independent access to the Committee.

4.—The Manager should then have the superintendency of the commercial portion of the undertaking, the chemical industry arising out of the manufacture of residuals, the entire distribution department, and the advising as to the installation of new plant.

5.—Your Committee recommend that, in addition to the method of testing gas now in use, a Gas Examiner should be appointed who should be an independent official of the Gas Committee. It should be his duty, as often as may be found necessary, to test the gas for the purpose of ascertaining its pressure, illuminating power, and purity. He should report the results from time to time to the Gas Committee, and such results should be laid before the Town Council as often as may be prescribed.

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There is no gas undertaking in the kingdom better managed than the Sheffield Gas Company. . . The commercial part of their business is dealt with by an extremely capable General Manager, who is the executive officer for the buying of coal and the selling of coke and other residual products. The Engineer is, therefore, free to give all his time and attention to the development, maintenance, and management of their three works, and to the distribution of the gas. These duties are quite sufficient to keep him fully employed. In small concerns one man must be engineer, manager, and everything—in fact more, perhaps, of the manager than the engineer; but with large undertakings such as yours, a division of labour is essential. There is another reason. No man is a universal genius; and, speaking generally, although there may be exceptions, the man who by instinct, inclination, and training becomes a capable engineer, is not likely to possess

account a second time, as, having reduced the calorific value, their further effect on the flame temperature due to specific heat is almost negligible.

So much for calorific intensity, which affects the luminosity of our incandescent mantles. We have other uses of gas to consider, as pointed out by Dr. Colman. Mr. Brown, in his paper cited above, gave some interesting figures as to the greater efficiency of B.Th.U.'s in water gas than in coal gas. In one experiment, he states that a gas-engine did the same work with 240 water-gas B.Th.U. as it did with 285 coal-gas B.Th.U.; an increase in efficiency of 19 per cent. In another example, he shows the B.Th.U.'s in Mond gas 17 per cent. more efficient than those in coal gas. These are very considerable differences of efficiency when calorific values are widely different, and point to some calorific value less than that of coal gas being most suited to the present design of engine. Mr. Brown's results were taken from engines carefully regulated; but in the case of the ordinary engine, the lack of scientific supervision will tell most on the high-grade gas where there is more room for it to act. These figures of Mr. Brown's seemed to have been overlooked in the discussion; but they are well worth consideration.

My point, however, was not so much the merits of any particular system, as the consumer's position in the matter. Dr. Colman says it must be shown that, under practical conditions, the consumer obtains as much or more heat, light, or power for the same amount of money as formerly. I would agree with Dr. Colman if he would paraphrase his demands to read that, under practical conditions, the consumer shall obtain equal or greater satisfaction of his requirements in the way of heat, light, or power for the same amount of money as formerly. The loss to gas-engine users of having their hands idle because the gas-engine is sooted up would make them eager to have a thinner gas supplied to them, which would make their engines run more reliably. It is not merely cost of gas which affects engine-users.

Down to some unascertained limit, incandescent burners give less trouble as you degrade the gas. In many other directions the consumer with low-grade gas has benefits in saving of labour and greater reliability which fully compensate him for lessened thermal value. My main argument, however, is that, provided you don't go below a certain limit of calorific value and flame temperature, the consumer wants a low-priced gas irrespective of quality, and wants it for the reasons suggested in my address. Acetylene has a calorific value about 2½ times as great as coal gas. Would it be seriously suggested that consumers would be better off with acetylene at 6s. 3d. than with coal gas at 2s. 6d.? The unsatisfactory divisibility of electric arc, acetylene, and now even incandescent gas lighting, prejudices their use—more light having to be used than required; and there is scope for a degraded gas which won't force a consumer to produce more light than he wants, and will enable him to get as much as he does require for less money.

Reverting for a moment to inert gases. The adoption of the air process of revivification, and the abandonment of lime purification, result in the admixture (respectively retention) of inert nitrogen and carbonic acid aggregating to about half the inert gases introduced by blending in the example suggested by Dr. Colman. The saving in cost of purification so obtained would not admit of a *pro ratâ* reduction in the selling price, yet any outcry against defrauding the consumer by measuring out to him gas so thinned with nitrogen and carbonic acid quickly subsided; and I believe the outcry against the Shadbolt process of blending, which is merely two or three strides more in the same direction, will in due course subside as we get more familiar with it, as I think there is indication we shall. Several who have water-gas plants in large works are already blending freely; and when they realize that B.Th.U. in coal or blue water gas cost about three times as much as they do in producer gas, and that the 60 per cent. of nitrogen in producer gas is reduced to 5 per cent. in the blend, and again, to under 1 per cent. of final products of combustion, I prophesy they will experiment as I am doing.

R. Bruce Anderson.

5, *Westminster Chambers, S.W.*,
Sept. 27, 1906.

A Combination Gasholder Valve.

Sir,—I have two holders worked by two valves only—one on their inlets and the other on their outlets, which allows either one or both to be on for filling or discharging at will. But now a third holder is required, and a similar arrangement of one valve filling or discharging is desired—that is to say, working with any single one of Nos. 1, 2, and 3, also in combinations of No. 1 with No. 2, No. 2 with No. 3, and No. 1 with No. 3, or all at once, at will. Is there such a valve now on the market?

Combination.

The Exhibition at Limerick.

Sir,—In reply to the letter of Mr. H. Hawkins in your last issue, I did not place any stigma on the Munster-Connaught Exhibition; and I fail to see how anybody reading my letter in the preceding number can say I did. What I said (and I say it again) was that the gas industry is inadequately represented at it in comparison with the other lighting industries—electricity and acetylene; and Mr. Hawkins's letter proves this. I am sure you will agree with me that half-a-dozen Welsbach incandescent "C" burners with plain chimneys and no globes, and with mantles fixed on the 9th of July last, can hardly be termed up-to-date incandescent gas lighting, even if "the same six mantles are still to be seen in use, and in perfect order."

Mr. Hawkins states that the exhibition is "not a gas exhibition, but an exhibition of purely Irish industries." Well, you would imagine gas made in Limerick was as much entitled to the term "Irish manufacture" as electricity or acetylene generated there. Perhaps the reason for electricity being given the preference in the lighting of the exhibition was the City Electrical Engineer offering his services free to the Exhibition Committee. As an Irishman, I protest against Mr. Hawkins's remarks that "the exhibition is purely a private venture of a few enterprising gentlemen in the city;" and I refer anybody interested in the matter to the official guide-book and catalogue, where he will find that every county in Munster and Connaught is represented on the Committee by some of their leading inhabitants.

I also find, on referring to the catalogue of exhibits, that the Whitehaven Colliery Company, of Whitehaven, have an exhibit; and it is one of the first a visitor will notice on entering the exhibition. I should like to know from Mr. Hawkins why an English Colliery Company were allowed to exhibit, while "several very noted makers of gas fittings, meters, lamps, and engines were refused on account of their goods not being manufactured in Ireland." At the Whitehaven Company's stand, coke is exhibited; and I did not see any exhibit of coke by the Limerick Gas Department. I should also like to know if the department were refused permission to light the exhibition on the same terms as those on which it is at the present time lighted by electricity and acetylene.

Sept. 28, 1906. An Irish Gas Manager.

Mr. Brearley and the Manchester Exhibition.

Sir,—Your luminous comments on my letter, or rather, I should say, on my own personal shortcomings, ought, I presume, to have effectually "extinguished" me. One can conjure up visions of the editorial fury which prompted you to deflect the discussion from the subject to the individual—visions in which the Editor, describing half-a-circle in his revolving chair, exclaims to his amanuensis, like a Monarch of the Mediæval Ages to his faithful henchmen, "Off with his luckless head." One cannot carry the analogy any further; for decapitation in those days was—happily for the victim—a short, if sorry business; whereas, even after the drawn-out slashing in your last issue, I am not yet controversially dead. Let me, however, crave another week in which to frame my reply. I have been so busy this week trying to memorize the contents of your last issue (lest I should be accused of being behind the times in the news of the gas industry), that I have had no time left to deal more fully with your comments in time for insertion in the present issue.

Longwood, Sept. 29, 1906, Jno. Hy. Brearley.

[We shall await, with peculiar interest, the further letter promised by the author of the above.—Ed. J.G.L.]

Engineering and the Workman.

Sir,—In your leader last week, you deal with a subject generally considered unsuitable for discussion in a technical paper; but as it has for its object the stimulating of manufacturers to effect a decided check to Socialism, it ought to form a precedent and be largely adopted by other papers in every trade. We have too long allowed the interested leaders of this movement exclusive access to the untrained intellects of the horde forming their following.

There are three kinds of Socialism: First, that defined by the words—a community of interests for the betterment of their own particular class. The second, as practised by the leaders, might be termed "Selfism." The last is true "Socialism," or a community of interests for the betterment of society, irrespective of class.

What is required, then, is to counteract the efforts of the misguided leaders of "Socialism," by the dissemination of true ideas as to what constitutes true progress towards the universal good of mankind. And this should be done, in and out of season, by means of literature in every shape and form.

Just consider again for one moment the creed of the Socialist as expressed in the quotation you give, which I venture to repeat: "That the unemployed partly owe their position to Science, with all other easy methods of production, being used to benefit the few against the interests of the many."

I know the working man of the type to which these remarks are addressed, and am aware that the doctrine will be accepted as gospel; and yet could greater twaddle be uttered? It is, however, this kind of talk which leads to strikes and unuttered signs of discontent among the labouring classes. It hampers the masters to the detriment of the general public (which, of course, includes the aforesaid labouring classes).

As "Socialism" would seek to put a drag on the progress of the perpetually moving wheel of Science, so likewise, if allowed a free hand, it would strive to strangle Individualism, and make human beings undistinguishably alike. It might as well try to make all men wear the same sized hats or boots.

It seems redundant to point out to even the followers of "Socialism" that it is only by Science that we in this isolated water-bound country can live in affluence as we do—enjoying the luxuries of other countries, but by familiarity esteeming them only as naturally within our reach. It is an axiom to say that Science and Progress by Invention cannot benefit one class to the exclusion of another. For instance, the invention of the refrigerator has done enormous good to the lower classes by giving them cheap and good meat, and other things which are exotics and which otherwise would not be within their reach, but might be procurable to the select few.

Again, where would the working man find his cheap white bread but for the inventive genius of individuals. Our country contains 43 millions of people, and it could not grow enough corn to feed them and at the same time leave sufficient men to maintain the commercial prosperity for which we are noted. We therefore have to seek elsewhere; and even in favourable climates the production would not be feasible unless it had been rendered possible by those "easy" methods so decried by the "Socialists."

Is it not apparent that the seed could not be sown, nor the harvest reaped in time, unless by the mechanical means now in use? So likewise but for speedy transit by rail and sea, and rapid handling by automatic appliances at docks and in mills, the corn could not be got ready for the oven in the required time, and at the low price which obtains at present.

Here one sees that it is the general public who benefit, not only by the procuring of cheap food, but in addition by the employment of millions of men in raising, deporting, and distributing the products of industry.

As it affects the gas trade (which gives the light to enable men to work in comfort, and to illuminate the streets to let them walk in security), where should we find ourselves but for the individual genius

of men like Murdoch, &c. We all know the devil works in darkness. Well, the present-day ideas of Socialists, by stifling Science and Invention, would plunge us into physical and intellectual darkness; and at the same time they would have prevented millions of men from working in the gas and allied trades.

As Steele puts it, "What a wretched and apostate state is this! to be offended with excellence, and to hate a man because we approve him."

63, *Rectory Road, N., Sept.* 27, 1906. ARCH. S. B. LITTLE.

Gas Explosion at Newbury.—There was a severe gas explosion on Monday afternoon of last week at the Newbury Electricity Works; but fortunately, though several men had narrow escapes, no one was hurt. An auxiliary gas-making plant had recently been erected at the works; and a trial took place on the preceding Saturday, when everything appeared to work in a satisfactory manner. On Monday, however, when further tests were about to be made, it was found that the holder, which is 15 feet in diameter, would not descend—possibly through being jammed by some obstruction. In fixing up the tackle required to rectify the defect, it is considered probable that it canted to one side, and that air was thus allowed to mix with the gas. Later on a back-fire from the engine may have ignited the gas. In the resultant explosion the holder was wrecked.

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in a high degree, and moreover has not had the opportunity of training and developing, the commercial faculty. It is, therefore, well to keep, when practicable, the duties separate.

The Meeting of the Council.

There was a large attendance at the meeting of the Council yesterday under the presidency of the MAYOR (Councillor A. Cleaver). The debate turned mainly upon the publication of the evidence given before the Investigation Committee; it being urged by the Chairman (Alderman Sir John Turney) and others that, in the best interests of the city, it was undesirable that any such publication should be permitted.

In moving the adoption of the report given above, Sir JOHN TURNEY observed that the work of the Investigation Committee had not been of a very pleasant character; indeed, in many respects it had been of a very painful nature. In conducting the investigation, the Committee decided to divide the work into two parts. One might be called the personal aspect of the matter, dealing with certain charges that had been made; and the other referred to the reconstruction of the gas undertaking, so far as they could possibly deal with it. A good many meetings were held, and certain gentlemen came before the Committee and made statements which it was difficult to understand; but, to sum the thing up in a few words, the statements were so conflicting that it was impossible for the Committee to come to a different decision from that at which they had arrived. They thought the less said about the personal side of the question the better, and that the sooner they began to set their house in order the better it would be for them. With reference to the other portions of the report, he wished to point out that they were only in the nature of suggestions that were made for the consideration of the new Committee, and they could accept or reject them as they pleased. But the Special Committee were of opinion that the suggestions made in the report were such as ought to be carried out. He knew that some of his friends in the Council thought that if another official were appointed, there would be dual control; but the Special Committee only suggested that, when matters connected with the gas undertaking came up for consideration at a future date, arrangements which were in practice every day in large engineering works, and particularly on railways, should be borne in mind. In such works, one man was not in absolute control over everything. More than one man had the advantage of coming before the Board of Directors when dealing with important works. But the greatest importance the Committee attached to their report was in regard to the paragraph which dealt with the appointment of the Gas Committee. They believed that there were many men in the Council who could undertake the management of the business, who could reorganize it, and put it on a proper basis that would not only result in showing a profit, but afford satisfaction to the people of Nottingham. Though a profit had been shown on the working, there had not been a great deal of satisfaction on the part of the public. He knew some of the difficulties attaching to the appointment of Committees—he knew how some of them were chosen; and he did not think it was possible for the leader of one party in the Council (Dr. Fraser) or the leader of the other party (Sir John M'Craith) to arrange, at the private meeting which was held for the purpose, a Committee which would give satisfaction, and undertake the proper discharge of the duties. Therefore it was that the Special Committee recommended that the General Purposes Committee of the Council should be entrusted with the selection of names to be submitted to the Council as those of gentlemen who were to form the Gas Committee. The Special Committee, speaking personally, had no feeling in the matter. All they desired to do was to put the undertaking on a proper basis, such as would once and for all remove discontent and dissatisfaction. There was no undertaking as a trading concern under the control of the Corporation which was comparable in size with that dealing with the supply of gas. They had the responsibility for water, electricity, and tramways devolving upon them as a Corporation; but these were entirely different things. The Gas Committee had to deal with an enormous produce from the raw material; and they had to see that the raw material used in carbonizing—the coal—was properly dealt with in the carrying out of the work. There was a high profit to be obtained from products which had to be dealt with; and by putting them on the market properly, it necessitated that they should have a man with a very perfect knowledge of chemistry. Not only did they need an official of this capacity, but also a man of good commercial status, who was in touch with the markets in which the products were sold, so that the best prices could be made. This was one of the reasons actuating the Special Committee in recommending a division of labour. There was no Committee who had greater difficulties to contend with, and to whom the essential importance was more strongly presented of managing the undertaking on sound commercial lines, than the Gas Committee. The concern must be run on sound business lines.

Alderman Sir J. T. M'CRAITH seconded the motion.

Mr. J. H. BROWN protested against the section of the report which dealt with the delegation of further powers to the General Purposes Committee. It seemed to him, he said, that it was the proper business of the Council to select the Gas Committee; but it appeared now that everything was to be done by the General Purposes Committee.

Sir J. TURNEY, interposing, said Mr. Brown's interpretation of the matter was quite at variance with his own intention; and he thought it was an unkind remark to make.

Mr. T. WARD asked what was meant by the phrase in the report that the charges made against the Gas Engineer had not been proved. Was it meant that the charges made by various consumers throughout the city that it was bad gas which had been supplied, had not been substantiated? The charge which had been laid against the Gas Engineer was, as he (Mr. Ward) understood it, one of incompetency. Did it mean that they were to retain the present Gas Engineer's services at the excessive salary he was paid? There was nothing in the report on this point. Personally, he thought the Council were capable of electing a Gas Committee who would give every satisfaction to the city, without leaving the selection to the General Purposes Committee.

Dr. MILNER expressed his satisfaction, as a member of the Gas Committee, that the Special Committee decided that the charges made against the Gas Engineer had not been proved. He said he could give Mr. Ward the assurance that Mr. Brown, who had won the gold medal which represented figuratively the blue riband of the gas world, was a man thoroughly well able to deal with the gas undertaking. There were various things, however, they would like to know something about on points which had arisen during the investigation, and one was that in regard to which one of the City Auditors had called attention. He referred to the allowance of a sum of £35, representing the amount conceded to a certain firm by way of gas allowance. It was impossible to deal with the whole subject adequately unless they had before them the evidence adduced before the Investigation Committee; and he proposed that the full evidence be supplied to every member of the Council, so that they might deal with it properly.

Mr. E. N. ELBORNE, a former Mayor, seconded the proposition. He urged that, before they passed the Committee's report, or acted upon the recommendations made, they ought to have an opportunity of examining the evidence. He did not want to go into personal matters; but he should like, as far as possible, to deal with other points that were involved.

Alderman JELLEY characterized the report as being rather peculiar. It stated that the charges made against the Gas Engineer had not been proved. He did not know what charges were made against Mr. Brown. He (Alderman Jelley) made no charges against the Engineer. Sir John Turney, in moving the adoption of the report, had said that some of the statements made to the Special Committee could not be understood. This also looked rather peculiar.

Sir J. TURNEY (interposing) said what he did say was that there were conflicting statements.

Alderman JELLEY (continuing) referred to the first paragraph of the report, and asked what were the charges the Committee considered. After the many complaints which had been heard, would the town be satisfied with the first paragraph in the report, which said that nothing had been proved? He took it that the townspeople were sufficiently alert to be able to judge of the value of what they were receiving and paying for. Were they mistaken in what they had been saying about the quality of the gas? Did the Special Committee think there were no complaints to be reasonably made in regard to the gas undertaking? After the first paragraph in the report, there were eight different clauses which clearly contradicted it. While saying that the charges were not proved, the Committee recommended that there should be an Engineer, a Manager, and a Gas Examiner. Did they recommend that the present Engineer should be placed in either of these important positions? They made no recommendation on the question of what his salary was to be if the present Engineer was to be retained as Manager. The report was altogether very vague, and failed to give a lot of information which ought to be supplied on a matter of this importance. Did the Council think the members of the Gas Committee who had resigned their positions considered that everything was satisfactory and proper? Did they think that the men who relinquished these positions did not take any interest in the work, and walked out because they did not understand it? Members were to be appointed on the Committee to sit there and allow money to be wasted, and the undertaking to be mismanaged; but he was not going to be one of them. He thought the duty of the Special Committee was to advise as to what should be done with the Manager, and to make suggestions whereby improvements might be effected, and not such vague ones as were those contained in the report. He hoped the Committee would see their way to withdraw the first clause; and then he thought there would be some sense remaining in the report.

Major ASHWORTH (the Vice-Chairman of the Gas Committee), who has been filling the position of Chairman since the withdrawal of Mr. Harlow, seconded the proposal made by Dr. Milner, in order, he said, that the whole of the facts might be laid before the Council. What were they doing that morning but simply working in the dark? As Acting-Chairman of the Gas Committee, he did not know anything about the so-called charges; neither did any other member of the Committee, except what he was told. They ought to have a clear case before them. As to Sir John Turney's remark about appointing a Committee who would make the undertaking pay, had not the present Committee made it pay? Did they not return the largest profits last year that they had ever made? And though they were at present without the essence of the Committee, the remnant had been carrying on the work. What he thought was, that it was not the Committee who were at fault, but that more backbone was needed in the Corporation ranks. They did not want every man in the Council to talk as though he knew everything. There was no other Committee who had worked so diligently as the Gas Committee.

Sir J. TURNEY: You ought to have a medal. (Laughter).

Major ASHWORTH replied that they had in that respect a Manager who had won a high honour.

Sir J. TURNEY: You must certainly have a medal for management. (Renewed laughter.)

Major ASHWORTH said he knew one or two other Committees in the Council who required medals for management. What he contended was that they ought to face this question like men. If they wanted to discharge the Engineer, let them say so. Do not let them go round about the matter, and appoint another man to work side by side with him. No sane man in any business undertaking would ever permit such a thing. One man would not suit the other. What power would their Gas Manager have under such an arrangement? If a manager was fit to direct, let them have one, and pay him accordingly. If they were not satisfied with their Manager, let them say so at once, and get quit of him.

Mr. A. BALL said he did not agree with all Major Ashworth had said as to the Gas Committee working so desperately hard. He was one of the "remnants" of the Committee; but he did not think there was as much done as was reasonably necessary in regard to the attendances. He personally felt that not only was the Manager at fault, but that the Committee's work might be improved. His recommendation was that a Sub-Committee should be appointed to visit the works every week. It seemed to him that they had voted on the Committee large sums of money without considering what they were doing. As to the

making of water gas, the Engineer had suggested it to them. He (Mr. Ball) was glad that the large expenditure was being taken into consideration; and he trusted the Council would see the necessity of appointing one of the strongest Committees it was possible to select for the management of such an important undertaking.

Alderman FRASER said he thought they would all agree that the best thanks of the Council were due to the Investigation Committee. They must be well aware that the reason why a Special Investigation Committee was appointed was to enable anyone and everyone who was able to give confidential information to do so in security, and without fear of any consequences, or of the law of libel. They might take it for granted that the Committee would not betray any evidence given under these circumstances. If every man who spoke to the Committee had spoken in fear of the law of libel, very little would have come to the knowledge of the Council. They appointed the Committee because they had confidence in the members of it, and because, as a body, they formed a very strong Committee, and they were entitled to the respect and confidence of the whole Council. They had two matters to deal with—the minor and less important one of the personal matters involved in this controversy; and the major and more important one of how this undertaking should be managed in the future. The personal matter had been dealt with by the Committee, and he had confidence in their decision. They had heard all the evidence, and had been able to judge of the way in which it had been given; and they had arrived at a conclusion which the Council undoubtedly ought to affirm. Then they dealt with the future. He should like to emphasize the grave interests that were involved. They were on their trial, so to speak, as to whether they were able to manage a concern of this magnitude. He had always been in favour of a moderate degree of municipal trading. Conducted on right lines, and with a moderate amount of skill, it was for the benefit of the ratepayers. But if they were to allow the great business interests which were involved in an undertaking of this sort to be made the mere football of personal antagonists in the Council, and to neglect them for the perhaps more exhilarating pastime of making charges against each other, they were only demonstrating their unfitness for carrying on an undertaking for the town. It was a business undertaking, and had to be conducted on business principles. All the Special Committee had done had been to make suggestions; and it was simply a suggestion that there should be a division of managing or governing the gas undertaking. It must be obvious to all, if they would consider the enormous size of the concern, that there must be a division of labour if the best results were to be obtained. But the Special Committee had not put it dogmatically. They recommended that when the new Committee was formed they should make a division of labour. The Committee might adopt it or not. In his own opinion they would be wise if they did. There had been a good deal of discussion upon the idea that the Gas Committee was to be appointed by the General Purposes Committee. The proposal, if he understood it correctly, was that the General Purposes Committee, dealing with the matter carefully, would select a number of gentlemen to form the Gas Committee in the future.

Sir J. TURNEY: That is so.

Alderman FRASER: They would merely select. The election, or rather the actual appointment, would be in the hands of the Council as it always had been. It would be open for the Council to dissent from the recommendations in the same manner as they did from those of other Committees. But, above all, he was impressed with the view that it was high time this agitation about the Gas Committee should terminate. For months, for probably more than a year, there had been ceaseless criticism, both in the Council and out of it—he had no doubt whatever very ill-founded—and complaints against the management of the gas undertaking. If this sort of thing was to continue, there would be a feeling of weariness steal over all of them, and they would be more and more disinclined to take any part or share in so unpleasant a business. He was convinced that there was nothing in the management of the gas undertaking which was not within the reasonable competence of a very large number at least of the members of the Council. He was not so much in favour of blaming any official whatever for mismanagement. If he were on a Committee who fairly did their duty, he would undertake to keep any official living in a reasonable degree of order. But he thought they had better cease any personal discussion, for by it they were doing no good to themselves or to the ratepayers. The business that lay to their hands was to elect a competent Committee; and he had no doubt that the gas undertaking could easily, in the near future, be made into a successful concern.

Mr. LOVERSEED, speaking as a member of the Gas Committee, paid a tribute to those members of the Council who, having other work to attend to, had gone into this matter. He said it was not a pleasant task when personal matters had to be discussed; and they deserved the thanks of the citizens. As to the suggested alterations in the management, he thought that the change should have taken place years ago. When Sir George Livesey's report was received, he suggested that two men should be appointed, for they could not expect one man to act as Engineer and yet go up and down the country selling their products. He (Mr. Loverseed) personally believed that, in their Gas Engineer, they possessed a very clever man. At the same time, he had hoped the report would have been a little stronger on the personal charges made; and he thought the Committee were blameworthy in not saying who, in their opinion, was at fault—whether one side or the other.

There being at this point loud cries of "Divide."

Mr. E. HARLOW (the former Chairman of the Gas Committee) said he just wished to make a few remarks, though he should not have spoken but for the observations of Dr. Milner and Mr. Loverseed. To his thinking, Dr. Milner had not brought an impartial mind to the consideration of the matter, but had shown partisanship. So far as the return of the £35 to a certain firm——

Sir J. TURNEY (interposing): Please do not go into that. I ask you not to do so.

Mr. HARLOW: Very well, I will not do so. I have heard some nasty things said; but I will not go into that. Major Ashworth said he did not know anything about the charges. All I have to say in answer to that is that it is time he did. The complaints made as to the quality of the gas supplied were, I think, justified. Then arose the question as to who was responsible. The Committee say the charge against the Gas Engineer is not proved; and I am quite satisfied.

Alderman Sir JOHN M'CRAITH said it was impossible for him to answer as he would like the remarks of Alderman Jelley and Mr. Harlow without quoting all that was done and said before the Special Committee. Therein lay their difficulty. They could not say all that they would say, because it was supposed to be a confidential investigation, details of which were not to be allowed to reach the outside world. He sympathized very much with those gentlemen who thought that they were entitled to this information, more especially after the remarks made that morning. There were grave charges made—not merely charges of bad gas, but other charges altogether; and he thought it would have been better in the first instance if every member of the Council could have had the evidence before him. It was a question whether or not it was privileged—whether privileged to the Committee. He took it that it was the privilege of every member of the Council to have the report. He strongly thought they ought to have had the report that morning, and that the matter would never be satisfactorily settled until this was done. Alderman Jelley had asked why they did not deal with the Gas Engineer, and settle the charges against him.

Alderman Sir JOSEPH BRIGHT interposed at this juncture, and said he wished to propose a resolution which he thought was perfectly in order. If the discussion went on, every member had a right to speak; and, for the good of the undertaking, he thought they ought to accept the advice of Alderman Fraser. He therefore moved—"That the question be now put."

Mr. T. WARD: Shall I be in order in moving an amendment to that?

The MAYOR: I must call you to order.

Sir JOHN TURNEY asked if he had the right to reply.

The MAYOR: I understood you did not wish to reply.

Sir JOHN TURNEY: Oh yes, I do.

Mr. G. HOBSON seconded the resolution proposed by Sir Joseph Bright; but, on a division, it was defeated by 16 votes to 15, several members refraining from voting.

Sir J. T. M'CRAITH, resuming his speech, remarked that Alderman Bright might have spared himself the trouble of interrupting him, for surely he must have known that he (Sir John) would not say anything which they, as a Committee, ought to keep secret. Alderman Jelley, referring to the first clause in the report, had said that he did not know anything about the charges made. In reply to that, he (the speaker) had to ask what was their first procedure. They called three gentlemen who had left the Committee to give evidence as to what was wanted. They simply considered what they had to say; but what the charges were he could not possibly tell them. His main object in rising was to protect the Committee against that remark, although he sympathized entirely with those who were curious to know all about the evidence.

Alderman Sir JOHN TURNEY, in replying upon the discussion, thanked Dr. Fraser for his remarks. He said the inquiry had been one of the most exceptional that he remembered since he entered the Council about 34 years ago. He did not take seriously what Alderman Jelley had said, that if they struck out the first paragraph of the report they would have practical common sense in the rest of it. In making their inquiry, the Committee had acted in the interests of the whole community. It was understood by the witnesses heard by the Committee that the evidence would be treated in a confidential way, and would not be made public—at any rate, not by the Committee. With reference to the Acting-Chairman of the Gas Committee, he (Sir John) wished he had not lost his head so much. The Chairman of the "remnants," as they had been called, and others of the members who remained in office, had been invited to come before the Investigation Committee, but had declined to do so.

Mr. FREEMAN and one or two other members here rose and declared that they had not been invited to attend.

The TOWN CLERK said that what Sir John Turney had stated was perfectly true.

Sir JOHN TURNEY (continuing) said the Acting-Chairman and the "remnants" were invited to come, and they declined to do so unless the Investigation Committee would place before them all the evidence which had been taken. This the Committee declined to do; and therefore they would not come forward and render any help, either with reference to the gas undertaking, the Engineer, or anything else. As to the remarks of Mr. Ward, if he had had as much experience in organizing and controlling large numbers of men as some other members of the Council had, he would not have talked in the slipshod manner he had done. What he asked them to be very careful to see was that the men they got on the Committee had the control of the undertaking, and were able to regulate the movements of the men. If they did this, they would accomplish all the Special Committee expected.

Mr. WARD rose to speak again, but was ruled out of order by the Mayor.

The TOWN CLERK remarked that what Dr. Milner proposed to do in relation to publishing the report could not be done without breaking the law.

The amendment as to supplying to members of the Council copies of the statements made before the Investigation Committee, on being put to the vote, was lost; and the Committee's report was afterwards adopted—there being only one hand held up against it.

The meeting then ended.

Water Scheme for Berwick.—The Berwick Town Council have decided to adopt a water scheme for the whole borough, including Berwick, Tweedmouth, and Spittal, at an estimated cost of between £18,000 and £20,000. The same scheme was defeated in the Council last January.

LOCOMOTIVES AND WAGGONS IN FACTORIES.

Report on the Home Office Draft Regulations.

It will doubtless be in the recollection of our readers that in the spring of last year the then Home Secretary, acting under the powers contained in section 79 of the Factory and Workshop Act, 1901, certified that the use of locomotives, waggons, and other rolling-stock on lines of rail or sidings in any factory or workshop, or any place to which the provisions of the section named are applied, or on lines of rail or sidings used in connection therewith, or any such place not being part of a railway within the meaning of the Railway Employment (Prevention of Accidents) Act, 1900, was dangerous. Thereupon, on the 12th of May, he issued certain draft regulations accompanied by a circular-letter intimating that persons desirous of having them further considered should lodge objections. These were subsequently received from 297 persons, firms, and public bodies; among them being, as our readers are aware, several gas companies and gas-supplying local authorities. On receipt of the objections, the Secretary of State caused further inquiries to be made; and in the result decided to make certain modifications in the regulations, and to direct an inquiry to be held with regard to them. Mr. Chester Jones, of the Middle Temple, was appointed to hold the inquiry, which he commenced at the Caxton Hall, Westminster, on Nov. 22, 1905, and sat in all on 13 days. The results of the inquiry are embodied in the Commissioner's report, which was issued last Thursday. A very large number of objectors appeared or were represented; and the proceedings were duly reported in the "JOURNAL."

After taking into account the exemptions assented to by the Secretary of State, there were broadly speaking three classes of factories and workshops to which the regulations would apply: (1) Ordinary factories and workshops, as defined by section 149 of the Factory and Workshop Act, 1901, together with the lines and sidings used in connection therewith; (2) docks, wharves, quays, and warehouses which, under the provisions of section 104 of the same Act, are to be regarded as factories for the purpose (among others) of making regulations for dangerous trades, together with the lines and sidings used in connection therewith; and (3) locomotive and waggon building and repairing shops, and the lines and sidings used in connection therewith, being part of the undertaking of a railway company. With respect to the two last-mentioned classes of factories, the main question was whether, for the various reasons advanced, they should not be exempted altogether from the operation of the regulations; and Mr. Chester Jones came to the conclusion that they should be so exempted.

As to the first-mentioned class of factories and workshops, a set of regulations was ultimately evolved, which, speaking generally, were practically agreed to by the representatives of the Home Office and the occupiers. Sir Hamilton Freer-Smith, the Superintending Inspector for Dangerous Trades, was the first witness called. At the conclusion of his evidence, the giving of which occupied the greater part of three days, it became apparent that further modifications would have to be made in the draft regulations. These which were assented to by the Home Office, were subsequently embodied in a document which was further amended, and eventually passed in the following form.

DRAFT REGULATIONS FOR THE USE OF LOCOMOTIVES AND WAGGONS ON LINES AND SIDINGS IN, OR USED IN CONNECTION WITH, PREMISES UNDER THE FACTORY AND WORKSHOP ACT.

These regulations shall come into force on the 1st day of January, 1907, except regulations 2, 3, and 24, which shall come into force the 1st day of January, 1908.

Subject to the exemptions below, it will be the duty of (1) the occupier of any factory or workshop, and any place to which any of the provisions of the Factory and Workshop Act, 1901, are applied, and (2) the occupier of any line of rails or sidings used in connection with a factory or workshop, or with any place to which any of the provisions of the Factory and Workshop Act, 1901, are applied, to comply with Part I. of these regulations; and it shall be the duty of every person who, by himself, his agents, or workmen, carries on any of the operations to which these regulations apply, and of all agents, workmen, and persons employed, to comply with Part II. of these regulations; and it shall be the duty of every person who, by himself, his agents, or workmen, carries on any of the operations to which these regulations apply, to comply with Part III. of these regulations.

In these regulations "line of rails" means a line of rails or sidings for the use of locomotives or waggons, except such lines as are used exclusively for (*a*) a gantry crane or travelling crane, or (*b*) any charging machine or other apparatus or vehicle used exclusively in or about any actual process of manufacture. "Waggon" includes any wheeled vehicle or non-self-moving crane on a line of rails. "Locomotive" includes any wheeled motor on a line of rails used for the movement of waggons and any self-moving crane. "Gantry" means an elevated structure of wood, masonry, or metal, exceeding 6 feet in height, and used for loading or unloading, which carries a line of rails whereon waggons are worked by mechanical power.

Nothing in these regulations shall apply to—

(*a*) A line of rails of less than 3 feet gauge, and locomotives and waggons used thereon.
(*b*) A line of rails not worked by mechanical power.
(*c*) A line of rails inside a railway goods warehouse.
(*d*) A line of rails forming part of a mine within the meaning of the Coal Mines Regulation Act, 1887, or of a quarry within the meaning of the Quarries Act, 1894, not being a line of rails within or used solely in connection with any factory or workshop not incidental to the maintenance or working of the mine or quarry or to the carrying on of the business thereof.
(*e*) Pit banks of mines to which the Metalliferous Mines Regulation Act, 1872, applies, and private lines of rails used in connection therewith.
(*f*) Lines of rails used in connection with factories or workshops, so far as they are outside the factory or workshop premises, and used for running purposes only.
(*g*) Waggons not moved by mechanical power.
(*h*) Buildings in course of construction.
(*i*) Explosives factories or workshops within the meaning of the Explosives Act, 1875.
(*j*) All lines and sidings on or used in connection with docks, wharves, and quays not forming part of a factory or workshop as defined in section 149 of the Factory and Workshop Act, 1901.
(*k*) Waggon or locomotive building or repairing shops, and all lines and sidings used in connection with such shops, if the shops are in the occupation of a railway company within the meaning of the Regulation of Railways Act, 1871.
(*l*) Depôts or car-sheds being parts of tramway or light railway undertakings authorized by Parliament, and used for the storage, cleaning, inspection, or repair of tramway cars or light railway cars.

PART I.

1.—Wherever, except at junctions, persons employed have to work or pass on foot between any two lines of rails, the distance between the lines shall, when the provision thereof is reasonably practicable, having regard, among other things, to the expense involved, the space available, the nature and extent of the traffic, and the exigencies of any actual process of manufacture, be such as to enable such persons to work or pass in safety. When the provision of such distance is not reasonably practicable, efficient means shall be taken to prevent danger to persons employed, either by providing suitable ways for such persons, and prohibiting passing between lines, or by other suitable and reasonable provisions or by rules, which prohibitions and rules shall be duly notified and enforced. Where persons employed have to work or pass on foot between a line of rails and any fixed structure above the ground level other than a platform or place used for loading or unloading, the distance between such line and such structure shall, where reasonably practicable, having regard, among other things, to the expense involved, the space available, the nature and extent of the traffic, and the exigencies of any actual process of manufacture, be such as to enable such persons to work or pass in safety. Where the provision of such distance is not reasonably practicable, efficient means shall be taken to prevent danger to persons employed, either by providing adequate recesses at intervals of not more than 20 yards, or by prohibiting such persons passing between such lines and structures, or by other suitable and reasonable provisions or by rules, which prohibitions and rules shall be duly notified and enforced. This regulation shall not apply in the case of a vertical crane on a line of rails.

2.—Point rods and signal wires in such a position as to be a source of danger to persons employed shall be sufficiently covered or otherwise guarded.

3.—Ground levers working points shall be so placed that men working them are clear of adjacent lines, and shall be placed in a position parallel to the adjacent lines, or in such other position, and be of such form, as to cause as little obstruction as possible to persons employed.

4.—Lines of rails and points shall be periodically examined and kept in efficient order, having regard to the nature of the traffic.

5.—Every gantry shall be properly constructed and kept in proper repair. It shall have a properly fixed structure to act as a stop-block at any terminal point, and at every part where persons employed have to work or pass on foot there shall be a suitable footway; and if such footway is provided between a line of rails and the edge of the gantry, the same shall, so far as is reasonably practicable, having regard to the traffic and working, be securely fenced at such a distance from the line of rails as to afford a reasonably sufficient space for such persons to pass in safety between the fence and a locomotive waggon or load on the line of rails.

6.—Wherever any definite point on a line of rails which is regularly used as a level crossing by persons employed is dangerous, proper means shall be taken, according to the circumstances of the case, to prevent danger to such persons, such as the provision of a notice-board, or barrier, or watchman, or, where necessary, a bridge or subway, or by suitable and reasonable rules duly notified and enforced. If at such a point there be on the same line of rails two waggons less than 12 feet apart, no person shall cross or be allowed to cross between them.

7.—Coupling poles or other suitable mechanical appliances shall be provided where required for the purpose of Regulation 13.

8.—Proper sprags and scotches, when required, shall be provided for the use of persons in charge of the movement of waggons.

9.—Where during the period between one hour after sunset and one hour before sunrise, or in foggy weather, shunting or any operations likely to cause danger to persons employed are frequently carried on, efficient lighting shall be provided, either by hand lamps or stationary lights as the case may require, at all points where necessary for the safety of such persons.

10.—The mechanism of a capstan worked by power and used for the purpose of traction of waggons on a line of rails shall be maintained in efficient condition; and if operated by a treadle, such treadle shall be tested daily before use.

PART II.

11.—When materials are placed within 3 feet of a line of rails, and persons employed are exposed to risk of injury from traffic by having to pass on foot over them or between them and the line, such material shall, as far as reasonably practicable, be so placed as not to endanger such persons, and there shall be adequate recesses at intervals of not more than 20 yards where the materials exceed that length.

12.—No person shall cross a line of rails by crawling or passing underneath a train of waggons thereon where there may be a risk of danger from traffic.

13.—Locomotives or waggons shall, wherever it is reasonably practicable without structural alterations, be coupled or uncoupled only by means of a coupling-pole or other suitable mechanical appliance, except where the construction of locomotives or waggons is such that coupling or uncoupling can be safely and conveniently performed without any part of a man's body being within the space between the ends or buffers of one locomotive or waggon and another.

14.—Sprags and scotches shall be used as and when they are required.

15.—Waggons shall not be moved or be allowed to be moved on a line of rails by means of a prop or pole, or by means of towing by a rope or chain attached to a locomotive or waggon moving on an adjacent line of rails, when other reasonably practicable means can be adopted: Provided that this shall not apply to the movement of ladles containing hot material on a line of rails in front of, or adjacent to, a furnace. In no case shall props be used for the above purpose unless made of iron, steel, or strong timber hooped with iron to prevent splitting.

16.—Where a locomotive pushes more than one waggon, and risk of injury may thereby be caused to persons employed, a man shall, wherever it is safe and reasonably practicable, accompany or precede the front waggon, or other efficient means shall be taken to obviate such risk: Provided that this regulation shall not apply to (*a*) fly shunting or (*b*) movement of waggons used for the conveyance of molten or hot material or other dangerous substance.

17.—No person shall be upon the buffer of a locomotive or waggon in motion unless there is a secure handhold, and shall not stand thereon unless there is also a secure foot-place; nor shall any person ride on a locomotive or waggon by means of a coupling-pole or other like appliance.

18.—No locomotive or waggon shall be moved on a line of rails until warning has been given by the person in charge to persons employed whose safety is likely to be endangered: Provided that this regulation shall not apply to a self-moving crane within a building, or to a charging-machine or other vehicle, so long as it is used in or about any actual process of manufacture.

19.—Where persons employed have to pass on foot or work, no locomotive or waggon shall be moved on a line of rails during the period between one hour after sunset and one hour after sunrise, or in foggy weather, unless the approaching end, wherever it is safe and reasonably practicable, is distinguished by a suitable light or accompanied by a man with a lamp; provided that this regulation shall not apply to the movement of locomotives or waggons within any area which is efficiently lighted by stationary lights.

20.—The driver in charge of a locomotive, or a man preceding it on foot, shall give an efficient sound signal as a warning on approaching any such level crossing as is mentioned in Regulation 6, or any curve where sight is intercepted, or any other point of danger to persons employed.

21.—A danger signal shall be exhibited at or near the ends of any waggon or train of waggons undergoing repair, wherever persons employed are liable to be endanged by an approaching locomotive or waggon.

22.—(*a*) The space immediately around such a capstan as mentioned in Regulation 10 shall be kept clear of all obstruction. (*b*) Such capstan shall not be set in motion until signals have been exchanged between the man in charge of the capstan and the man working the rope or chain attached to it. (*c*) No person under 18 years of age shall work such capstan.

23.—No person under the age of 18 shall be employed as a locomotive driver, and no person under the age of 16 shall be employed as a shunter.

PART III.

24.—All glass tubes of water gauges on locomotives or stationary boilers used for the movement of waggons shall be adequately protected by a covering or guard.

In the course of his report, Mr. Chester Jones makes the following remarks.

As this code, with the exception of two matters in respect of Regulation 1 and of some alterations in form, is practically the result of agreement between the Home Office and the occupiers, and as the Home Office, who represent the interests and safety of the workmen, are satisfied, and the employers are prepared to accept the code, I am not clear that it is within my province to say anything more about it; and if my objection to the regulations was that they were too stringent or that they were too lenient, I should say no more. My objection, however, to Regulations 1 and 6 of the code, as finally evolved, is not that they are too stringent or too lenient, but that they are so hedged about with reservations that they would fail to get rid of the dangers aimed at; and, further, in respect of these dangers, in my opinion it is impossible to make a rule applying to all the factories and workshops in which locomotives and waggons are used that will get rid of these dangers.

The regulations as made in the first place were apparently introduced in the main to carry out the recommendations of the Dangerous Trades Committee. Then exceptional cases cropped up in which it appeared that great hardships would be entailed if the regulations as originally drafted were put in force. They were thereupon modified to suit these cases. Further inquiry by the Factory Department and the publicity of the proceedings revealed other exceptional cases that had to be provided for, until, as regards Nos. 1 and 6, the regulations have become such a mass of reservation and provisos as to be practically of little value. Looking at Regulations 1 and 6, I find it difficult to see that it would be possible to enforce them so as to provide for the safety of the workmen; and I fear the compliance with Regulation 1 will degenerate into the occupier making a set of rules which either would not get rid of the danger or would be impossible of enforcement, and the compliance with Regulation 6 would merely mean putting up a notice-board.

What is really wanted is a regulation for each factory, and not one regulation for all factories. As it is impossible to deal with the matter in this way, I am of opinion that the best course to take is to rely on the provisions of section 17 of the Factory and Workshop Act, 1901, which may possibly require slight amendment. The effect of this would be that each factory could be dealt with separately. Subsection 1 of this section is as follows:—

> A Court of Summary Jurisdiction may, on complaint by an inspector, and on being satisfied that any part of the ways, works, machinery, or plant used in a factory or workshop (including a steam-boiler used for generating steam) is in such a condition that it cannot be used without danger to life or limb, by order prohibit its use, or, if it is capable of repair or alteration, prohibit its use until it is duly repaired or altered,

It appears to me that if two lines of rails are so close together, or if a line of rails is so close to structures, or if a level crossing is so unprotected, as to cause danger to persons employed, such cases come within this section as being part of the ways or work in a factory or workshop in such a condition that it cannot be used without danger to life or limb. That is my opinion; but, as a judicial authority might possibly hold otherwise, some slight amendment of the section might be necessary so as to make the point quite clear. I recommend, therefore, that Regulations 1 and 6 should be deleted from the code, and that reliance should be placed on section 17 instead; and as the dangers which it is sought to avoid have been so fully brought to the notice of the occupiers by these proceedings, it is difficult to imagine that they will allow their premises to remain in such a condition as to be an offence against this section. To some extent, Regulation 11 also is open to objection on account of its vague and indefinite character; but as there would be great difficulty in utilizing section 17 in the circumstances the regulation is intended to cover, it would, perhaps, be as well to let it stand for what it is worth. This is all I have to say in respect of the regulations I recommend for adoption in the factories and workshops to which they are to apply.

THE PRICE OF GAS IN NEW YORK.

In the "JOURNAL" for the 18th ult. (p. 784), we reported a decision given by Justice Giegerich in an application made by a consumer of the Consolidated Gas Company of New York for a writ of *mandamus* to compel them to supply him with gas at 80 c. per 1000 cubic feet, in accordance with the statute. The application was granted; but subsequently the Counsel for the Company (Mr. Carl A. Mead) applied for permission to re-argue the matter after certain amendments had been made in the Company's answer. The new defence was as follows: "The Consolidated Gas Company of New York own a large amount of property necessarily invested in the business of manufacturing and supplying gas, upon the reasonable value of which they are entitled to earn an adequate return. If the Company should receive only 80 c. per 1000 cubic feet for the gas supplied to the customers, which is the rate fixed by the Act of 1905, the amount so received would exceed very little, if any, the actual reasonable cost to the Company of manufacturing and distributing the gas; and if the Company should be compelled to sell gas at the 80 c. rate, they would receive little, if any, return upon the value of their investment in the business, and would certainly not receive an adequate return upon the reasonable value of the property invested in it, and would thus be deprived of their property without just compensation, and without due process of law, contrary to the provisions of the Constitution of the United States and of the State of New York." On behalf of the petitioner, it was asserted that the allegation that the Company would not receive an adequate return upon the reasonable value of their property, was a conclusion of law, and that the essential facts on which it rested were: (1) "The reasonable value of the property necessarily invested in the business; (2) the cost of manufacturing and distributing gas; (3) the amount of gas sold and distributed; (4) the dividend percentage at the $1 rate; (5) the dividend percentage at the 80 c. rate." The matter came before Justice Giegerich on the 6th ult. He said he was of opinion that the criticism was well founded, and then continued: "It may be that it would not be necessary to make allegations on all the five points enumerated; but something more is needed than the broad and general statement the defence contains. For aught that appears, the return might be 6 or 8 or even a higher percentage of annual profit, but which the defendants may nevertheless deem inadequate. The ultimate question for the Court to determine is whether the Act is unconstitutional in depriving the defendants of their property without compensation, without an adequate return. Merely asserting that such is the fact is not sufficient, in my judgment, to delay or suspend the operation of the statute. To accomplish that effect, the defendants should allege facts sufficient for the Court to determine whether the legal inference of inadequacy of return is well supported or not. The Court has a right to know what the facts are that it may judge whether the legal inferences are well drawn." He decided not to grant the application. The diction of the learned Judge is not particularly clear; but the effect of his decision is that the Company must not charge more than 80 c. per 1000 cubic feet for their gas, as specified in the statute. The question whether the rate enacted is a just and equitable one is now under adjudication by the Supreme Court of the United States.

Justice Giegerich has also decided that the Northern Union Gas Company, who operate in the Bronx, must alter their slot meters so as to give 310 cubic feet of gas for 25 c. Mr. Clarence J. Shearn, appearing on behalf of a consumer, asked for a peremptory writ of *mandamus* to compel the Company to so adjust the slot meter on the premises of the plaintiff that it would deliver gas at the rate of 80 c. per 1000 cubic feet. The answer put in by the defendants declared that it was impossible to adjust the meter in question so as to furnish gas at the precise rate of 80 c. per 1000 cubic feet. The answer also declared that to alter the meter so as to render such adjustment possible would be an expensive process, and would entail delay and confusion. The nearest practicable adjustment, as the machines are now constructed, would supply for 25 c. 310 cubic feet instead of 312·5 cubic feet of gas, which is the amount required by the 80 c. rate. Justice Giegerich said that the difference was so trifling that it should be overlooked under the circumstances. He granted the motion to the extent of requiring the defendants to adjust the meters so as to furnish 310 cubic feet of gas for 25 c.

The Directors of the River Plate Gas Company have declared an interim dividend at the rate of 6s. per share, free of income-tax, for the half year ended June 30.

BRITISH GASLIGHT COMPANY, LIMITED.

The Half-Yearly Ordinary General Meeting of this Company was held last Wednesday, at the London Offices, No. 11, George Yard, Lombard Street, E.C.—Mr. J. Horsley Palmer in the chair.

The Secretary (Mr. H. B. Chamberlain) read the notice convening the meeting, as well as the report of the Directors, together with (in pursuance of the Act of Parliament) the Norwich accounts. The report was as follows :—

The Directors submit the half-yearly accounts of the Company to June 30 last, as examined and certified by the Auditors, who have also vouched for the correctness of the several investments held by the Company.

The available profit is £28,723 16s. 1d., after deducting the following sums: Income-tax, £1431 17s. 11d.; Hull debenture interest, £2137 10s.; Norwich debenture interest, £1130 10s.; Potteries debenture interest, £665; Trowbridge debenture interest, £166 5s.; and interest on debenture stock, £2280—total, £7811 2s. 11d.

Hull.—The gas-rental shows an increase of £2352 as compared with that of the corresponding period of 1905; the price of gas having been the same—viz., 2s. per 1000 cubic feet. Coke shows an increase of £600, tar and tar distilling a decrease of £235, and ammoniacal liquor and sulphate of ammonia an increase of £90. Coals have cost 12s. 1d. per ton, as against 12s. 2d. Coke has realized 10s. 5d. per ton, as against 10s. 8d.

The gas sent out was 585,928,000 cubic feet, against 556,214,000 cubic feet in the corresponding period of 1905—an increase of 29,714 000 cubic feet, equal to 5·34 per cent. Of this quantity, 45,213,000 cubic feet was supplied in bulk to the Corporation for the supply of the old town.

The profit realized is £416 9s. in excess of the parliamentary interest. This sum has been invested, making the reserve fund £27,203 12s. 9d.

Norwich.—The gas-rental shows an increase of £2050 as compared with that of the corresponding period of 1905; the price of gas having been the same—viz., 3s. 3d. per 1000 cubic feet. Coke shows an increase of £29; and tar and ammoniacal liquor an increase of £3. Coals have cost 15s. 8d. per ton, as against 15s. 8d. Coke has realized 14s. 7d. per ton, as against 14s.

The gas sent out was 237,142,000 cubic feet, as against 225,840,000 cubic feet—an increase of 11,302,000 cubic feet, equal to 5 per cent.

The profit realized, after writing off £5182 on account of reconstruction of works and offices, is £989 16s. less than the parliamentary interest.

Potteries.—The gas-rental shows an increase of £781 as compared with that of the corresponding period of 1905; the price of gas having been the same—viz., 2s. 6d. per 1000 cubic feet. Coke shows an increase of £815; tar an increase of £27; and ammoniacal liquor and sulphate an increase of £386. Coals have cost 10s. 4d., against 10s. 8d. per ton. Coke has realized 6s. 7d. against 6s. 11d. per ton.

The gas sent out was 191,732,000 cubic feet, against 186,167,000 cubic feet—an increase of 5,565,000 cubic feet, equal to 2·98 per cent.

The profit realized, after writing off £5000 on account of buildings and plant thrown out of use, is £1209 14s. 6d. less than the parliamentary interest. This sum has been taken from the reserve fund, leaving a balance of £11,295 17s.

Trowbridge.—The gas-rental shows an increase of £160 as compared with that of the corresponding period of 1905; the price of gas having been reduced from the 1st of April, 1905, from 3s. 2d. to 3s. per 1000 cubic feet, with the usual discounts. Coke shows an increase of £57; and tar, ammoniacal liquor, and sulphate a decrease of £37. Coals cost 15s., against 15s. 3d. per ton. Coke realized the same price per ton—viz., 9s. 5d.

The gas sent out was 36,339,500 cubic feet, against 33,385,000 cubic feet—an increase of 2,954,500 cubic feet, equal to 8·84 per cent.

The profit realized is £956 13s. 2d. less than the parliamentary interest. This sum has been taken from the reserve fund, leaving a balance of £29 1s. 7d.

Holywell.—The gas-rental shows an increase of £105; and residual products a decrease of £10. The profit realized is £439 1s. 8d.

The available profit added to the previous balance of profit and loss amounts to £61,979 6s. 10d. From this sum the Directors recommend a dividend at the rate of 10 per cent. per annum, free of income-tax. This will amount to £24,500, and leave a balance of £37,479 6s. 10d.

The Directors who go out of office are Major-General William T. Corrie and Mr. Leonard R. Wilkinson; and the Auditors are Mr. Edward Yardley and Mr. E. Knowles Corrie. They respectively offer themselves for re-election.

The Chairman said that on the last occasion when they met in that room, he took the liberty of making a prophecy with regard to the course of the Company's affairs in the half year which was now under review. Speaking then of the very small increase that was shown at their stations in the amount of gas sold during the preceding six months, he said he had every reason to believe that, owing to the turn of trade, they would be able to show the proprietors on this occasion a very much more satisfactory increase. He was very glad that the accounts and report which had just been read to them showed that his words had come true; for at Hull they had an increase of 5 34 per cent., at Norwich of 5 per cent., at the Potteries of 3 per cent., and at Trowbridge of 8·84 per cent. This proved, he thought, that the trade of these great towns had revived, and that they—as a barometer, he might say, of these places—at once felt the result of the improvement. He also at the same time ventured on another prophecy with regard to the Hull station (which was, as they knew, their principal station); but this had not come out quite so correctly as he hoped it would have done. He then informed the shareholders that the Board had completed writing off what was required for the alteration of one of the retort-houses; and that he anticipated they would carry forward, beyond their parliamentary interest, a very large sum of money which might be used for various purposes. It was true they had had a surplus of £416 beyond what they were entitled to divide among themselves; but he had hoped that it would be something like £2400. The reason for this difference was easily to be explained. Their Company, like nearly every gas company, had for many years past been embarking in a gas-stove business. This was a very profitable business, so far as it went, in the encouragement of the use of gas for all sorts of purposes. But there were drawbacks to taking up this branch on a very large scale, which he thought every gas company felt at some time or another. It was true that the life of a gas-stove, if properly used, properly cleaned, and properly repaired, varied, he would say, from ten to twenty years, but it also had another life, which might be called its "fashionable life." They all knew that, in these days of progress, gas-stove makers were continually finding out new ways of improving their wares; and when ladies saw these new stoves, they immediately said to the gas company, "Please take away the old stove you put in five or six years ago, and we should like one of the newest and latest models we saw in your show-room in the town." They were obliged to meet their customers in this way; and they found it exceedingly difficult to place on some other customer the old stove taken out of (say) "Mrs. Smith's" house. Of course, the Directors had always charged what they considered a proper depreciation on this branch of business; but there came a time, every now and again, when they were obliged to have recourse to the pruning knife, and cut down the gas-stove account by scrapping some of the old stoves which people would not take. As he had said, this happened now and then; and on the present occasion the Directors had thought fit to go very closely into the matter, and had spent a very considerable sum in replacing these old stoves by modern ones. This explained why they had not carried forward a larger balance to the reserve fund at Hull than the £416 which appeared in the accounts. Now they would turn to the Potteries for a few moments. There had happened at that station an event which had never before occurred in the history of the Company. As he supposed some of the shareholders were aware, the Company supplied two distinct districts there—the Hanley and the Tunstall areas. The two places were separated by about 3 miles; and the district between did not belong to the Company. It was Burslem, which was supplied by a Corporation works. The Company, however, had the right, under an old Act of Parliament, to lay a main from Hanley right through Burslem so as to enable them to light Tunstall. When the Directors re-built the works at Hanley adjoining the railway, and went to great expense, they were able to make gas there at a reduced cost; and so they thought it would be to the interest of the shareholders to lay the main through Burslem—which would enable them to supply Tunstall in the summer from the Hanley works, and shut down the somewhat more expensive works at Tunstall. This was carried out without any difficulty being raised by the Burslem authorities. They took Counsel's opinion, it was true; but they put no obstacles in the Company's way. The Company were most happily situated with regard to their relations with the Corporation officials; and therefore the whole matter went through very smoothly. The Board were glad to be able to put on record the fact that this large trunk main was laid right through the heart of Burslem without any friction whatever between their officials and those of the Corporation. The business of the Company had gone on satisfactorily during the half year, and they had done exceedingly well. In fact, he might almost say—if it was possible—that they had done too well. They had carried over a large amount to the "rest," as he was in the habit of calling it, which now stood at £61,000. From this, they were able to pay their dividend of 10 per cent.; and they had added to this "rest" the sum of £4223. He did not know that he had anything more to say in regard to the Company's business. It was true that the future looked not quite so bright as it might do in respect to the labour question and also in respect to the cost of coal. No doubt there was a great deal of unrest among workmen, who made ridiculous demands which were not to be easily met. They were stirred up by people in London to make all sorts of claims upon the Company, though they were exceedingly well treated. The other matter he thought was a question of supply and demand. It was his opinion that coal would be substantially dearer within the next six months; and, of course, this would affect all gas companies throughout England. He sincerely hoped none of the British Gaslight Company's shareholders had been induced—by all kinds of circulars that had been issued, he thought, to almost every gas proprietor in the country—to invest in what he might call "little tin-pot gas companies," which had been floated, or tried to be floated, by speculators during the past six months. He regarded it as his duty, as the Chairman of a very old-standing and very successful Company, and in view of the fact that a very large number of shareholders in the Company were ladies and trustees, to warn them all against being influenced to join these concerns. It was a great pity, he thought, that such a splendid industry as the gas industry should be in any way brought into bad odour by companies of this sort being foisted upon the public. He concluded by moving that the report and accounts be received, adopted, and entered on the minutes of the meeting.

Mr. Frederick Wilkin seconded the motion; and it was at once carried unanimously.

On the proposition of the Chairman, seconded by Major-General W. T. Corrie, a dividend for the half year was declared at the rate of 20s. per share, clear of income-tax.

The retiring Directors were then re-elected—Major-General W. T. Corrie, on the motion of the Chairman, seconded by Mr. R. S. Gardiner; and Mr. Leonard R. Wilkinson, on the proposition of the Chairman, seconded by Mr. Wilkin.

The Auditors were also re-appointed—Mr. Edward Yardley, on the motion of Mr. Kenneth Mackay, seconded by Mr. B. F. Harris; and Mr. E. Knowles Corrie, on the proposition of Mr. Abbey Williams, seconded by Mr. H. G. Longdon.

Mr. Harris proposed a vote of thanks to the Chairman and Directors for their able management of the business of the Company. He remarked that it was most satisfactory—from all he could read in the accounts and between the lines—that their affairs were so well managed; and he was sure they owed a great deal to the Board for the efficient manner in which they carried out their duties.

Mr. Mackay seconded the proposal; and it was agreed to.

The Chairman having briefly acknowledged the compliment,

Mr. Corbet Woodall said he had much pleasure in proposing a vote of thanks to the Secretary and to the Engineers and officers at the various stations. Some two years ago they were passing through anxious times, and they had to re-build works at very considerable cost out of the profits of the undertaking—one of them threatening to tumble into the mines beneath, and the other being altered for municipal reasons. The Company were now reaping very considerable advantages from the changes; but the anxiety to which he had referred arose from the very large amount that had to be spent out of the profits. He thought the Chairman's interesting statement showed that there could not have been very much wanting in the officers' conduct of the business of the Company. Their Chairman did not often pose as a pessimist; and he (Mr. Woodall) hoped that his suggestion

that they might have to pay a high price for coal in the current half year would not be realized. But however it might be, he was sure the officers would do their best in the circumstances under which they might be placed.

Mr. GARDINER seconded the motion, and it was carried.

The SECRETARY acknowledged the vote; and this concluded the proceedings.

DORKING GAS COMPANY.

At the half-yearly general meeting of this Company, on the 25th ult., the Directors reported a balance of £1371 available for distribution; and they recommended the payment of dividends at the rates of 6 and 5 per cent. on the different classes of shares. This would absorb £1265, and leave a balance of £106 to be carried forward. There was an increase of 1·55 per cent. in the sale of gas, and a satisfactory addition of consumers and stoves during the half year covered by the report. The manufacturing operations had been satisfactory, resulting in a still further reduction in the cost of manufacture. The Chairman (Mr. Herbert Young), in moving the adoption of the report, said that, though the Directors were unable to recommend a larger dividend, there was an improvement in the affairs of the Company; the balance carried forward being £86 more than in the corresponding half of last year. Mr. Budgen, in seconding the motion, said he could not do so without expressing disappointment at the balance-sheet. The dividends recommended were extremely small for a gas company; and he thought there must be a weak point in the business which the Directors should find out. The Chairman said the Company were disadvantageously placed with regard to their great length of mains compared with other gas companies, though if they had not made the extensions they would probably not have been so well off as they were now. No doubt their works were much larger than was requisite for present consumption. A certain portion of them did not yield any interest yet; but the time would come when they would do so. The report was adopted. At a subsequent special meeting, the Directors were authorized to issue sufficient "D" shares to realize £5000.

ELECTRIC LIGHTING IN ISLINGTON.

Progressive Extravagance and "Paper" Profits.

A special representative of the "Pall Mall Gazette" has been inquiring into the present financial position of the Islington Borough Council; and in a recent issue he gave some figures which show in a striking way the capacity of the Progressives for getting rid of the ratepayers' money. They came into office in 1903; and the following year the total rates were 7s. 0½d. in the pound—the borough rates being 1s. 11½d. For the year ending March last, the figures were 7s. 3d. and 2s. 2½d.; and for the current year the total rates are 7s. 8d., which is 3d. less than it would be if the ratepayers were not relieved out of the equalization fund at the expense of other people. "Why have the rates thus gone up?" was the natural question put by the representative in question to an ex-Mayor of the borough. The answer was: "If the borough will return to the Council men who insist on having luxuries, the ratepayers must pay for them." One of the "luxuries" referred to was the electric light, in regard to which the ex-Mayor made the following remarks: "The electric lighting they are even carrying into the back streets. Incandescent gas lighting, although it has been shown to be a better light for public purposes than that given by arc lamps, was not considered good enough for Progressive Islington, so that the gas-lamps have had to be pulled down, and 120 miles of streets lighted at a cost of £260 a mile; whereas in Camberwell, which is one of the best-lighted London boroughs, and where the vigorous action of the ratepayers has just frustrated the Progressive scheme for electricity, the cost under contract is no more than £90 a mile, while in Lewisham it is considerably less." The representative pointed out that the Council claimed to have made a profit during the past year of between £4000 and £5000. "Yes, I know they claim a profit," was the answer; "but I do not hesitate to say that if they had been supplying only private customers they would have made an enormous loss. As it is, by charging themselves a higher price for public lighting than they ask the private consumer to pay, and by setting aside an insufficient sum for depreciation, they manage to show (on paper) figures which seem to be a profit, but by which no man of business can possibly be deceived." The Council have borrowed £406,000 for electric lighting purposes, and the undertaking has been condemned even by Mr. Torrance, M.P., an ex-Mayor of the borough, who, on an application from the Borough Council to the London County Council for sanction to additional loans, offered the following remarks: "Speaking broadly and for himself, he had no hesitation in saying that in the 30 streets proposed for electric lighting there would not be anything like a sufficient number of customers, seeing that the incandescent gas system had already been installed. He was not satisfied with the way in which the money already spent on electric lighting had been apportioned, since no provision had been made for reserve or renewal funds. He was afraid that in this matter Islington was heaping up liabilities with which hereafter it would find it difficult to deal." Remarks like these, coming from such a source, should surely not be allowed to pass unheeded. Now that the municipal elections are in sight, the ratepayers should consider seriously the advisability of throwing off the yoke of Progressive extravagance.

The St. Pancras Guardians have decided to postpone for six months any further action in regard to the proposal to substitute electric light for gas in the workhouse. The Local Government Board had previously written inquiring as to the specific reasons for the proposed substitution.

LEICESTER CORPORATION GAS UNDERTAKING.

At a Quarterly Meeting of the Leicester Town Council last Tuesday, the gas, electricity, and water reports for the half year to June, which were noticed in last week's "JOURNAL" (p. 844), were adopted.

In submitting the report relating to the gas undertaking, Mr. E. Edwards, Chairman of the Committee, said the expenditure up to the half year ended June 30 was £1,268,517. During the six months, they had spent £70,069 for the manufacture of gas, or an increase of £4487. The total sum expended for distribution purposes was £12,729, or a decrease of £1246. The amount paid in rates and taxes was £6352, or an increase of £202; and for management, £3227, which was a slight increase. The total expenditure was £92,567, or an increase of £3481. On the other side, they had received from the sale of gas £106,872, or a decrease of £905; for rentals of stoves, £1544; and for residual products, £25,805. The total income for the department was £139,211, or an increase of £544. Deducting the £92,567 expended, there was a balance to carry to the profit and loss account of £46,644, or a decrease of £2937. The net profit, after paying interest on the capital of the undertaking, would be £27,491. Out of this had been paid £7340, which was the half-year's amount of the sinking fund; and this left a balance of £20,151. They had a deficit of £2905 in the receipts for gas as compared with the preceding year; but it would be remembered that twelve months ago they reduced the price of gas for power purposes 6d. per 1000 cubic feet, which had meant a loss of income of £3064. They had, however, increased the sale of gas for power, and were now supplying gas for 361 engines. The action of the Council in reducing the price was a correct one; for they would undoubtedly have lost a lot of business had they not done so. During the past six months there had not been a single stoppage owing to naphthalene, which was due to the methods pursued by Mr. Alfred Colson, their Engineer. Mr. Colson had also invented a cash-box, which had been applied to a number of slot-meters; and it was now impossible for a thief to get the money. Out of the profit made, the Committee desired to add £5000 to the reserve fund.

GAS LIGHTING IN HAMMERSMITH.

According to the annual report of the Borough Surveyor of Hammersmith, which has just been issued, the total number of incandescent gas-lamps in the borough, under the control of the Council, on March 31 last was 1247. During the twelve months, 33 lamps were put up and 17 removed. The annual cost of the lamps, including lighting, cleaning, and maintenance, in the Brentford Gas Company's district was as follows: "C" incandescent burner, £2 12s. 10d.; No. 3 incandescent burner, £2 10s. 1d.; large incandescent lamps, £3 19s. 3d. and £4 4s. 9d. To the above figures must be added the annual cost of maintaining, cleaning, and repairing the burners, including the renewal of mantles, which for the year comes out at 7s. 6d. per lamp. This work is performed by lamplighters in the employ of the Company. The materials required for the lamps are issued by the Council to the men weekly. The total amount paid to the Company for the year was £2810 14s. 1d. The average cost of the public lamps, including lighting, cleaning, rent of column, and lantern, in the Gaslight and Coke Company's district, was as follows: 2·2-feet incandescent burner and bye-pass, £2 9s. 2d.; without bye-pass, £2 5s. 2d.; 3·5-feet incandescent burner and bye-pass, £3 1s. 1d.; without bye-pass, £2 17s. 1d.; 4-feet incandescent burner and bye-pass, £3 7s. 10d.; without bye-pass, £3 1s. 8d.; 20-feet Sugg lamp, £10 4s. 2d. The prices in the case of incandescent lamps do not include the cost of maintenance, cleaning, and repairing of the burners (including renewal of mantles), which for the year works out at 7s. 6d. per lamp. A similar arrangement for the cleaning, maintenance, &c., of the burners to that in the Brentford Company's district is in operation in the area of the Gaslight and Coke Company. The total amount paid to the latter Company for the year was £509 2s. 3d.

GAS AND ELECTRICITY AT SHEFFIELD.

Speaking last week at the opening of an exhibition promoted by the Electric Light Committee of the Sheffield Corporation, Alderman Styring, the Chairman of the Committee, remarked that on that occasion they were expected to talk about electricity; but he was constrained to say something about gas. At the recent meeting of the Gas Company, there was shown a sensibility on their part in regard to the proceedings of the Electric Light Department. This was a matter for some surprise, because the gas undertaking was not a feeble one, but the undertaking of a strong and powerful Company. It need not be afraid of anything that the Corporation might do. The Company appeared to think that because they were great ratepayers, some consideration ought to be extended to them. True, they paid some £17,000 or £18,000 a year in rates; but the shareholders got every shilling it was possible for them to get, their dividends being limited by Act of Parliament. Having received their 10 per cent., he failed to see that they could regard them as contributing much to the rates, or making any sacrifices in that direction for the interests of the city. There was, however, plenty of room for both gas and electric light; and in the years to come, he thought it would be found that there was no ground for fear that the Gas Company would not pay their dividends. There was no need for them to be afraid of the Corporation's small electric undertaking. There was no doubt electricity had come to stay; and recognizing the nature of modern developments, they must arrive at the conclusion that the future lay with electricity both for lighting and power purposes. When the difficulties which lay in the path of the Electric Light Committee, because of the circumstances under which they took over the electrical undertaking, were overcome,

they would be able to make immense strides forward; but while the future was with electricity, the purposes to which gas would continue to be applied clearly indicated increased prosperity also to the gas undertaking.

The Lord Mayor (Mr. H. Hughes) also referred to the Gas Company, and said there ought not to be any recrimination, because there was room for both. The Electricity Department might light people's houses cheaply; but the Gas Company could light and heat them cheaply, and there would always be scope for them there. Referring to the use of gas for power, he pointed out that the gas-engine had been revolutionized in Germany, where very large types were now employed. Under the distinguished guidance of Sir Frederick Mappin, who he was sorry was not able to be present with them that day, the Gas Company had been a lasting benefit to the City of Sheffield, and no mean factor in its success. The city had something to be proud of in a Gas Company who provided gas as cheap as, if not cheaper than, any other in the country. As to the Electric Light Department, they were going to run this for all it was worth; and the one thing for them to bear in mind was to cheapen the cost of production, no matter if they had to scrap a lot of machinery to do it.

DUBLIN CORPORATION WATER SUPPLY.

An Additional Reservoir to be Constructed.

The Dublin Corporation recently held a Special Meeting for the purpose of considering a report of the Water Committee recommending the provision of an additional storage reservoir at Roundwood (Co. Wicklow). The proposal involves an application to the Local Government Board for sanction to a loan of £134,842. The City Treasurer hopes that the money can be obtained at 3¾ per cent., repayable in 60 years by means of a sinking fund. On these assumptions, the necessary annual provision for interest and sinking fund on the loan amounts to £5680, made up of interest at £3 15s. per cent. and a sinking fund payment of 9s. 3d. per cent.—making together £4 4s. 3d. per cent. Mr. M'Call, in moving the adoption of the report, said it was in the knowledge of the Council that in 1893 the citizens of Dublin were face to face with a water famine. This was most unexpected, as it was thought that the Vartry water would never give out. This, however, was not the case in 1893, for no water was to be had in some parts of the city. The following year the Local Government Board warned the Corporation that a serious reponsibility rested upon them to take such steps as they might deem necessary to protect the inhabitants of Dublin and the surrounding townships against the consequences of the possible recurrence of an event which could not longer be regarded as unforeseen. Subsequently a Bill was promoted, and in 1901 an agreement was come to to build a reservoir at Roundhead. In Sir John Gray's time, it was held that the then supply would meet the requirements of half-a-million people; and so it would. But the conditions of the city had altered completely. The public health requirements had changed, and what was in those days considered as ample must now be regarded as quite insufficient. Speaking on the financial aspect of the question, he said the Committee hoped to get the money at 3¾ per cent., the repayment of which, with principal, would require £5680 a year. He asked the Council to consider this as a commercial transaction. At present, the Corporation were making about £10,000 by the sale of water; and he thought they could increase this revenue by the proposed undertaking. The City Treasurer had put the period of repayment at 60 years; but he (Mr. M'Call) was certain it would be cleared off in half that time. Mr. Briscoe seconded the motion, and expressed the hope that the Council would adopt the report, and continue a work which, when completed, would give Dublin the finest water supply in Europe. Alderman Doyle supported the motion. Mr. T. Harrington, M.P., said that the water-works were not a source of profit, except to the water undertaking itself. The Council were not in the position of merchants extending their business. The income derived from water must be applied to water-works purposes. The scarcity of water some years ago was due to carelessness in management. Those who had spoken in favour of the report had not displayed any expert knowledge. He contended that the present works were adequate for the supply. Alderman Irwin said he had come prepared to support the report; but he now thought definite information should be given on some of the points raised. He proposed, as an admendment, that the matter should be referred to a Committee of the Whole House. Some other members having spoken, a division was taken, and the amendment was defeated by 36 votes to 19. The report was then adopted.

Street Lighting by Gas in Deptford.

At the meeting of the Deptford Borough Council last Tuesday, the Lighting Committee reported that they had completed the improved lighting of the streets by gas; the work having been carried out under their directions since November, 1903. On the date mentioned, the Committee was constituted to consider and advise upon the lighting of the streets and highways in the borough; these duties up to that period having been performed by the Works Committee. At the commencement, the Committee inspected every street, in order to see what improvement, if any, should be made. The North Ward was selected for the initial survey, and it was realized that the lamps were placed too far apart, and that the street lighting could be made more efficient generally over the borough by having a standard distance not greater than 50 yards between the lamps. On the Committee's recommendation, this principle was adopted by the Council in February, 1904, and the lamps have since been arranged in accordance therewith. The scheme has resulted in the addition of 455 new lamps, while 541 have been removed and refixed in new positions, at a total cost of £1780. The following figures show the price and progress of the work during the three years: From November, 1902, to November, 1903, the cost of the gas supplied to the public lamps fixed in the borough was £3525 6s. 10d. During the twelve months to November, 1904, 77 new lamps were erected, and 139 existing lamps refixed in new positions, at a total cost of £421 2s. 1d. The cost of the gas supplied this year was £3611 13s. 2d. During the year ended November, 1905, 135 new lamps were erected, and 116 refixed in improved positions, at a total cost of £563 7s. 5d. The cost of gas that year was £3834 10s. 6d. From November, 1905, to the completion of the work in June last, 243 new lamps were erected, and 285 existing lamps were refixed in improved positions, at a total cost of £796 1s. 6d. The cost of the gas supplied during the three quarters under review amounted to £3196 8s. 1d. The report was adopted.

GAS COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 19.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.				£ s. d.
596,000	10	Apl. 11	10½	Alliance & Dublin 10 p.c.	21—22	..	4 15 5
245,112	10	,,	7½	Do. 7 p.c.	14½—15½	..	4 16 9
200,000	5	May 11	7	Bomt 1y, Ltd.. . . .	6¾—7¼	..	4 16 7
40,000	5	,,	7	Do. New, £4 paid	5—5⅝	..	5 1 10
50,000	10	Aug. 30	14	Bourne- mouth Gas and Water } 10 p.c. B 7 p.c. Pref. 6 p.c.	28—29	..	4 16 7
51,810	10	,,	7		16¾—17¼	..	4 1 3
53,200	10	,,	6		15½—16½	..	3 12 9
380,000	Stk.	Aug. 15	12½	Brentford Consolidated	260—265	..	4 14 4
300,000	,,	,,	9½	Do. New . . .	198—203	..	4 13 7
50,000	,,	,,	5	Do. 5 p.c. Pref. .	120—125	..	4 0 0
206,250	,,	June 14	4	Do. 4 p.c. Deb. .	103—106	..	3 15 6
220,000	Stk.	Sept. 27	11½	Brighton & Hove Orig.	230—235*	+1½	4 15 8
246,320	,,	,,	8½	Do. A. Ord. Stk. .	163—168*	..	4 18 3
460,000	20	Sept. 27	10	British	40½—41½*	..	4 16 5
104,000	Stk.	Aug. 15	6	Bromley, Ord. 5 p.c. .	119—123	..	4 17 7
165,700	,,	,,	4½	Do. do. 3½ p.c. .	90—93	..	4 16 9
500,000	10	May 11	7	Buenos Ayres (New) Ltd.	12¼—12¾	..	5 9 10
250,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
150,000	20	July 12	8½	Cagliari, Ltd.	24—26	..	6 6 11
100,000	10	Sept. 27	10	Cape Town & Dis., Ltd.	14¼—15¼*	..	6 9 0
100,000	10	Apl. 26	4½	Do. 4½ p.c Pref.. .	9⅞—10¼	..	4 7 10
50,000	50	May 2	6	Do. 6 p.c. 1st Mcrt.	52—54	..	5 11 1
50,000	Stk.	June 28	4½	Do. 4½ p.c. Deb. Stk.	98—100	..	4 10 0
1,443,280	Stk.	Aug. 30	5⅛	Commercial 4 p.c Stk. .	113—115	..	4 10 5
560,000	,,	,,	5	Do. 3½ p.c. do. .	110—112	..	4 9 3
475,000	,,	June 14	3	Do. 3 p.c. Deb. Stk.	84—86	..	3 9 9
800,000	Stk.	,,	6¼	Continental Union, Ltd.	123—126	..	5 3 2
200,000	,,	,,	7	Do. 7 p c, Pref.	140—145	..	4 16 7
432,070	Stk.	Aug.	5¾	Derby Con. Stk. . . .	122—124	..	4 8 9
55,000	,,	July	4	Do. Deb. Stk. . . .	105—107	..	3 14 9
486,090	10	July 27	11	European, Ltd. . . .	24—25	..	4 8 0
354,060	10	,,	11	Do. £7 10s. paid	18—19	..	4 6 10
15,203,110	Stk.	Aug. 15	4⅛	Gas- light and Coke } 4 p.c. Ord. . .	96⅝—100⅛	..	4 7 7
2,600,000	,,	,,	3½	3½ p.c. max. . .	86—90	..	3 17 9
3,799,735	,,	,,	4	4 p.c. Con. Pref.	108—111	..	3 12 1
4,193,975	,,	June 14	3	3 p.c. Con. Deb.	85—87	−1	3 9 0
258,740	Stk.	Sept. 13	5	Hastings & St. L. 3½ p.c.	98—103	..	4 17 1
82,500	,,	,,	6¼	Do. do. 5 p.c.	118—121	..	5 7 5
70,000	10	Apl. 11	11	Hongkong & China, Ltd.	20—21	..	5 4 9
940,000	Stk.	May 11	8	Imperial Continental .	186—189	..	4 4 8
473,600	Stk.	Aug. 15	3½	Do. 3½ p.c. Deb. Red.	95—97	..	3 12 2
184,242	Stk.	Aug. 30	6	Lea Bridge Ord. 5 p.c. .	120—125	..	4 16 0
561,000	Stk.	Aug. 30	10	Liverpool United A . .	230—232	..	4 6 2
718,100	,,	,,	7	Do. B .	167½—169½	..	4 2 7
306,083	,,	June 28	4	L'rpool Unit'd Deb. Stk.	107—109	..	3 13 5
75,000	5	June 28	5	Malta & Medn., Ltd. .	4¼—4¾	..	5 5 3
560,000	100	Apl. 2	5	Met. of 5 p.c. Deb..	103—105	..	4 15 3
250,000	100	,,	4½	Melbourne } 4½ p.c. Deb.	102—104	..	4 0 7
541,920	20	May 31	3¾	Monte Video, Ltd. . .	11½—12½	..	5 12 0
1,675,892	Stk.	Aug. 15	4⅝	Newc'tle & G'tesh'd Con.	111—112	+½	4 2 7
406,625	Stk.	June 29	3½	Do. 3½ p.c. Deb.	98—100	..	3 10 0
15,000	10	Aug. 30	10	North Middlesex 10 p.c.	20—21	..	4 15 3
55,940	10	,,	7	Do. 7 p.c.	13½—14½	..	4 16 7
300,000	Stk.	May 11	8	Oriental, Ltd. . . .	151—154	..	5 3 11
60,000	5	Sept. 13	7	Ottoman, Ltd. . .	5⅞—6⅞	..	5 12 0
398,490	5	Apl. 26	7	Primitiva Ord. . . .	6¼—7¼	..	4 16 7
796,980	5	July 27	5	Do. 5 p.c. Pref. .	5—5¼	..	4 15 3
488,900	100	June 1	4	Do. 4 p.c. Deb. .	97—99	..	4 0 10
851,070	10	Apl. 26	7	River Plate Ord. . . .	13—13½	+¼	5 3 8
300,000	Stk.	June 28	4	Do. 4 p.c. Deb. .	96—98	..	4 1 8
250,000	10	Sept. 27	8	San Paulo, Ltd. . . .	14—14½*	..	5 10 4
70,000	50	July 2	5	Do. 5 p.c. Deb. .	49—51	..	4 18 0
135,000	Stk.	Sept. 13	10	Sheffield A	241—243	..	4 2 4
209,984	,,	,,	10	Do. B	241—243	..	4 2 4
523,500	,,	,,	10	Do. C	241—243	..	4 2 4
70,000	10	May 31	10	South African	16—17	..	5 17 8
6,350,000	Stk.	Aug. 15	5½	South Met., 4 p.c. Ord.	132—134	..	4 2 1
1,895,445	,,	July 12	3	Do. 3 p.c. Deb.	86—88	..	3 8 2
575,000	Stk.	Aug. 15	5½	S'th Suburb'n Ord. 5 p.c.	123—126	..	4 7 4
60,000	,,	,,	5	Do. 5 p.c. Pref. .	123—126	..	3 19 4
112,533	,,	July 12	5	Do. 5 p.c. Deb. Stk.	128—133	..	3 15 2
502,310	Stk.	May 11	5	Southampton Ord. . .	107—112	..	4 9 3
120,000	Stk.	Aug. 30	6¼	Tottenham } A 5 p.c. .	125—130	..	5 0 0
588,020	,,	,,	5	and B 3½ p.c. .	100—103	..	4 17 1
137,500	,,	June 28	4	Edmonton } 4 p.c. Deb.	103—105	..	3 16 2
182,380	10	June 14	8	Tuscan, Ltd.	10½—11	..	7 5 6
149,900	10	July 2	5	Do. 5 p.c. Deb. Red.	104—106	..	4 14 4
30,000	Stk.	Aug. 15	8	Wands- worth and } A 5 p.c. . .	—	..	—
255,636	,,	,,	6½	B 3½ p.c. . .	137—142	..	4 11 7
75,000	,,	,,	5⅝	C 3½ p.c. . .	113—115	..	4 17 5
79,416	,,	June 28	3	Putney } 3 p.c. Deb. Stk.	82—85	..	3 10 7
779,875	,,	Aug. 15	5½	West Ham 5 p.c. Ord. .	105—107	..	4 15 9
185,000	,,	,,	5	Do. 5 p.c. Pref. . .	120—123	..	4 1 4
193,300	,,	June 28	4	Do. 4 p.c. Deb. Stk.	103—106	..	3 15 6

Prices marked * are "Ex div.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Edinburgh and Leith Gas Commissioners, at their meeting on Monday, had two months' business to transact; there having been no meeting during the holiday month of August. The most important item was the fixing of the estimates for the current year, and of the prices to be charged for gas. The estimates had been prepared by the Treasurer—Mr. John S. Gibb—who, in a covering letter, explained that he had had the benefit of the aid of the Chief Engineer, who had carefully formulated the items belonging specially to his own department—viz., expenditure for manufacture and distribution, and income from sale of gas and residual products. The Treasurer pointed out that 1d. per 1000 cubic feet of gas produced, on the year's estimated output, £7608; and the estimated probable surplus on the year's working is £1081. The estimates differ very little from the figures which were realized in last year's working. The quantity of gas expected to be sold is the same—1,845,159,000 cubic feet; and the revenue is also the same—£253,413. From the sale of coke there is expected to be derived £20,884—an increase of £2000; from gas tar and oil-gas tar, £13,044—a decrease of £848; and from sulphate of ammonia the revenue, less working expenses, is expected to be £20,792—an increase of £231. The total revenue is estimated at £308,853—an increase of £1278; and the total expenditure at £307,772—an increase of £997; and there is an estimated surplus of £1081. Coal is estimated to cost £104,513—an increase of £681; gas oil, £3783—an increase of £558; salaries and wages at works, £23,186; purifying materials and wages, £1914—both the same as last year; and repairs of works and plant, £21,040—a decrease of £2000. The total cost of the manufacture of gas is £154,436—a decrease of £702. Distribution of gas is expected to cost £24,086—a decrease of £492; management, £10,550—an increase of £332; feu-duties, £600—an increase of £123; rates and taxes, £15,000—a decrease of £943; pensions and allowances, £1700—a decrease of £51; law and conveyancing expenses, £1000—a decrease of £766; accidental damages, £200—an increase of £158; discounts, abatements, and bad debts, £6200—an increase of £43; annuities, £32,900—a decrease of £45; interest, £38,500—an increase of £2544; expenses of mortgages, £700—an increase of £22; the annuities sinking fund, £9200—a decrease of £37; the mortgage sinking fund, £11,800—an increase of £729; and the minimum contribution to reserve fund, £900—an increase of £240. These estimates were adopted, and the prices to be charged for gas were fixed at 2s. 9d. per 1000 cubic feet to ordinary consumers, 4s. 2d. for prepayment meter consumers, 2s. 5d. for flat-flame public lighting, and 2s. for incandescent public lighting.

The Commissioners approved of arrangements for the ceremony of the opening of the second section of the Granton Gas-Works, which is fixed for Monday, Oct. 15. A discussion then took place upon a motion by Bailie Maxton, which was to the effect that members of the Commission be not allowed to remove papers relating to contracts from the premises without the special permission of the Commissioners. Although it was stated that there was no suspicion that an improper use had been made of any papers so taken, the object of the motion was to safeguard the interests of the Commission, by preventing information being derived by tenderers as to what transpired when their offers were being dealt with. A direct negative was moved, and was carried against the motion by ten votes to eight.

The question relating to the sale of coke to members of the Corporation was again brought before the Town Council of Glasgow on Thursday by Mr. Scott Gibson. Lord Provost Bilsland was not present; being in Aberdeen attending the University celebrations. Mr. Gibson based his introduction of the subject upon the leading article in the "Glasgow Herald," to which I referred last week. The Town Clerk said that when at the previous meeting he answered a question by Mr. Gibson regarding the opinion of the Lord Advocate, he thought it superfluous on his part to say that he agreed with the Lord Advocate. The opinion of the Lord Advocate was absolutely confined to certain specific cases—the cases of traders who bought coke from gas-works belonging to a town council of which they were members, and sold it to customers. The Lord Advocate did not pronounce any opinion on the case of councillors purchasing coke from gas-works belonging to town councils of which they were members, for use on their own premises. Had the case arisen in Glasgow—it could not possibly arise now—it would have done so under the most favourable circumstances possible, for, in the first place, the Local Act contained a special clause authorizing the sale of coke; and, in the second place, coke had never been sold to any member of the Town Council at other than ordinary market prices, which were fixed and uniform, thus eliminating the element of bargaining, and absolutely precluding the possibility of conflict between duty and interest. At the same time he had, since his attention had been directed to the subject, advised town councillors privately—and he repeated his advice publicly—that the only safe and proper course was for them to follow the one which had been universally followed recently by town councillors in Glasgow—viz., to continue to abstain altogether from purchasing coke from the gas-works of the Corporation, either directly or indirectly, pending an authoritative pronouncement on the subject. In the express terms of the Act, assuming disqualification in the case supposed, disqualification lasted only so long as the contract lasted. The words of the Act were: "If and while such town councillor has an interest or share in such contract." It was in this view of the matter that at the previous meeting, not differing from the Lord Advocate, as had been supposed, he indicated his absolute certainty that the councillors whose qualification seemed to be challenged were absolutely clear from any disqualification. Mr. Sutherland, who said he felt a little in the matter, because he had been purchasing coke, asked if he would be at liberty to purchase through a third party, seeing that the Lord Advocate said "deals indirectly." The Town Clerk replied that

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

The Economical Gas Apparatus Construction Co., Ld.

W. H. PEARSON, Chairman.
W. H. PEARSON, Junr., Deputy-Chairman.
J. T. WESTCOTT, Manager.
L. L. MERRIFIELD, M.Inst.M.E., Engineer.

London Offices: 19, ABINGDON STREET, WESTMINSTER, S.W.
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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
Blackburn	1,250,000	Winnipeg, Man.	500,000	Malton	150,000
Windsor St. Works, Birmingham	2,000,000	Colchester (Second Contract)	300,000	Smethwick	500,000
Saltley Works, Birmingham	2,000,000	York	750,000	Gravesend	300,000
Colchester	300,000	Rochester	500,000	Pernambuco, Brazil	125,000
Birkenhead	2,250,000	Kingston, Ont.	300,000	Duluth, (Second Contract)	300,000
Devizes	120,000	Crystal Palace District	2,000,000	Leicester (Second Contract)	1,000,000
Saltley, Birmingham (Second Contract)	2,000,000	Duluth, Minn.	300,000	Newport (Second Contract)	250,000
Windsor St., Birmingham (Second Contract)	2,000,000	Caterham	150,000	Brockville	250,000
Halifax	1,000,000	Leicester	2,000,000	Toronto (Third Contract)	750,000
Toronto	250,000	Enschede, Holland	150,000	Montreal, Ont. (Second Con.)	1,800,000
Ottawa	250,000	Buenos Ayres (River Plate Co.)	700,000	Toronto (Fourth Contract)	1,000,000
Lindsay (Remodelled)	125,000	Burnley	1,500,000	Hamilton, Ont.	400,000
Montreal	500,000	Kingston-on-Thames	1,750,000	Rochester (Third Contract)	1,600,000
Toronto (2nd Cont., Remodelled)	2,000,000	Accrington	500,000	Leeds (Second Contract)	900,000
Belleville	250,000	Tonbridge	300,000	Buenos Ayres (Primitiva Co.)	1,200,000
Ottawa (Second Contract)	250,000	Stretford	500,000	Buenos Ayres (New Co.)	1,200,000
Brantford (Remodelled)	200,000	Oldbury	300,000	Christchurch, N.Z.	300,000
St. Catherines (Remodelled)	250,000	Todmorden	500,000	Rochdale	1,600,000
Kingston, Pa.	125,000	Saltley, Birmingham (Third Contract)	2,000,000	St. John's, Newfoundland	250,000
Peterborough, Ont.	250,000	York (Second Contract)	750,000	Brantford (Second Contract)	400,000
Wilkesbarre, Pa.	750,000	Rochester (Second Contract)	500,000	Smethwick (Second Contract)	500,000
St. Catherines (Second Cont.)	250,000	Newport (Mon.)	250,000	Pontypridd	250,000
Buffalo, N.Y.	2,000,000	Tokio, Japan	1,000,000	Montreal (Third Contract)	1,800,000
		Newcastle-on-Tyne	1,800,000	Guelph, Ont.	50,000
		Leeds	1,800,000	Buenos Ayres (River Plate Co.) Second Contract	750,000
				Belgrano (River Plate Co.)	500,000

And, in addition, COAL GAS PLANTS at NELSON, B.C., CHATHAM, BERLIN, NAPANEE, OWEN SOUND CALGARY, and WINNIPEG.

he could neither purchase directly nor indirectly; but, of course, he could buy in the open market from a coal merchant. Mr. Gibson moved the suspension of the Standing Orders so that he might propose that the opinion of Counsel as eminent as the Lord Advocate might be taken on the very important question. On a division, the motion was supported by 34 members and opposed by 28. The requisite majority was thus not obtained for the suspension, and the subject was passed from for the time being. The Editor of the "Glasgow Herald," in an article in yesterday's issue, declines to accept the opinion of the Town Clerk, and proceeds to say: "While not doubting for a moment that Mr. Bilsland has been entirely innocent of impropriety in the matter, and imputing no unworthy intentions whatever to anyone else, we adhere to our contention that the Lord Advocate's opinion must be held to apply to the cases that have arisen in Glasgow. By his action, and even by his words, the Town Clerk has conceded the danger involved in a continuance of practices which are suspect of illegality; and the citizens will rest content with the fact that a satisfactory issue has been attained, though, we fear, on somewhat illogical grounds." The subject cannot be said to be satisfactorily disposed of yet.

It has been reported to the Falkirk Town Council that the revenue of the Gas Department for the past year amounted to £29,026, and that there was a profit on the year's working of £1830. Of this sum there has been applied to reserve fund £1500; and the balance has been carried forward. The Gas Finance Committee recommended that the price of gas be reduced from 2s. 10d. to 2s. 9d. per 1000 cubic feet to ordinary consumers, to 3s. 1d. to prepayment meter consumers, to 2s. 4d. for power purposes, and to 2s. 6d. for cooking, with the usual discounts. Mr. Wilkie, in moving these recommendations, which were adopted, said these were the cheapest rates at which gas had been supplied in the burgh. They considered that the Gas Department was on a sound basis. The Council let the contract for the erection of a new gasholder at the Thornhill Gas-Works to Messrs. R. Dempster and Sons, Limited, of Elland, at the price of £10,750. The holder is to be erected by September next.

Dearth of Water in the Fen District.—In company with North Wales and other parts of the kingdom, the Fen country of West Norfolk and South Lincolnshire is suffering from shortage of water. In some villages, none is to be obtained; while in others limited supplies are available which are being retailed at 3d. per pail. On Friday morning, a special Midland and Great Northern train left King's Lynn to convey water to places along the line.

Question of Free-Cookers at Rochdale.—The Rochdale Gas Committee have been raising the question of supplying gas-cookers free of charge. They have requested the Engineer (Mr. T. Banbury Ball) to write to Lancashire corporation gas authorities in order to ascertain: (1) How many supply gas-cookers free of charge; (2) the number of authorities in whose area the cookers are fixed free; and (3) the price charged for gas for cooking purposes. When this information is before them, the Committee will further consider the question.

CURRENT SALES OF GAS PRODUCTS.

Week ending Sept. 29.

The London market for tar products continues in a strong position, and almost all the articles show an improvement upon the prices ruling a fortnight ago. There is a good demand for pitch, and 32s. net at makers' works is reported to have been paid for October-December delivery. An addition of 6d. to 1s. per ton is asked for next year. Ordinary London creosote is quoted at 2⅜d. net in bulk at makers' works. Sulphate of ammonia is not active, and the quotations, on Beckton terms, are £12 5s. for this year and £12 10s. for the early part of 1907.

Sulphate of Ammonia. LIVERPOOL, *Sept.* 29.

While the demand for prompt delivery in Scotland has been rather slack, it has at other points been well sustained, though prices remain very much the same as last reported. The closing quotations are £11 17s. 6d. per ton f.o.b. Hull, and £12 1s. 3d. per ton f.o.b. Liverpool and Leith. There has been good inquiry for October, for which £12 2s. 6d. per ton f.o.b. Leith and Liverpool is quoted. £12s. 5s. per ton for October-December does not attract buyers, and so far consumers abroad have not come forward at the parity of £12 10s. per ton delivery f.o.b. for January-April or January-June.

Nitrate of Soda.

The market is very strong in all positions, and spot prices are 11s. 10½d. and 12s. 3d. per cwt. for 95 per cent. and refined qualities respectively.

Tar Products. LONDON, *Sept.* 29.

Markets for tar products have been steady during the past week, without very much alteration in prices. Pitch still continues firm. London manufacturers ask 32s. 6d., stating that they have obtained 32s., and refused offers of 31s. and 31s. 6d. Business is reported to have been done on the east coast at 32s.; but an offer of some quantity for delivery from now to the end of the year was declined at 31s. 9d. On the west coast, 30s. is reported to have been refused at Manchester for delivery to the end of the year; while it is stated that 30s. 6d. has been paid over the same period, and that 31s. 6d. has been obtained in Liverpool. In South Wales, there does not seem to be quite so much inquiry as was the case a little while ago; and it would appear that consumers in this district are now covered for all their present requirements, and any further quantity which they might purchase would be for stock purposes. Continental consumers are still holding off the market; being evidently fairly well bought for delivery to the end of the year, and preferring to wait before committing themselves any further. It is reported that very low prices have been accepted in the North of France by a local distiller all over next year Creosote remains firm. The position of London manufacturers appear

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to be quite unchanged. They have very little to spare, and do not anticipate any difficulty in obtaining good prices for any small quantities which they may have later on. In the North, one or two manufacturers appear willing to sell at 1⅝d. for delivery over the next six months, which price has been refused in the Midlands, where it is evident that manufacturers are very short of stocks. There is no change in the position of carbolic acid. Continental consumers are willing to pay 1s. 9d. for prompt delivery; but for forward they refuse to pay more than 1s. 8½d., and state they have already covered some quantity at this price. There is still very little demand for crystals; and prices remain unchanged. Benzol continues very firm indeed. London manufacturers ask 10½d. to 10¾d. for delivery to the end of the year; while good prices are reported to have been paid in the Midlands at makers' works. 50-90 per cent. is still firm; but there is very little offering. On the east coast 11⅜d. continues to be asked, and 1s. in London. Solvent naphtha is very firm indeed. Ordinary London stuff has been sold in London at 1s. 3½d. per gallon for small quantities; while 1s. 4d. has been freely paid for prompt delivery, and 1s. 5d. for small quantities of special quality. Heavy naphthas also continue in good demand. There is no change in the position of toluol.

The average values during the week were: Tar, 15s. 6d. to. 19s. 6d. Pitch, London, 31s. to 32s.; east coast, 30s. to 31s.; west coast, 29s. 6d. to 31s. Benzol, 90 per cent., 10½d. to 10¾d.; 50-90 per cent., 11½d. to 1s. Toluol, 1s. 1½d. to 1s. 2d. Crude naphtha, 4½d. to 4¾d.; solvent naphtha, 1s. 2d. to 1s. 4d.; heavy naphtha, 1s. 1d. to 1s. 4d. Creosote, London, 2 1/16d. to 2 3/16d.; North, 1⅞d. to 1¾d. Heavy oils, 2½d. Carbolic acid, 60 per cent., 1s. 9d. to 1s. 9½d. Naphthalene, £4 10s. to £9 10s.; salts, 30s. to 35s. Anthracene, "A" quality, 1½d. to 1⅝d.; "B" quality, unsaleable.

Sulphate of Ammonia.

The market has been firm during the past week, with a fair amount of business doing. The principal London Gas Companies still quote from £12 2s. 6d. to £12 5s.; but business could undoubtedly be done in other makes at under these figures. In Hull, the prompt price may be taken as about £12; but for November-December £12 5s., and for the spring £12 7s. 6d. to £12 10s. is asked. In Liverpool, from £12 1s. 3d. to £12 2s. 6d. is about the prompt value, with considerably higher prices asked forward. In Leith, it would be difficult to buy anything for prompt at under £12 2s. 6d.; and for forward, makers ask from £12 7s. 6d. to £12 10s.

Progress of the Watford Gas Company.—At a recent complimentary dinner to the staff of this Company, it was stated that, despite the introduction of electric light into the town, the Company used four times more coal than they did twenty years ago, and manufactured 185 million cubic feet of gas, as compared with 45 millions. In the same period, the capital had increased from £40,000 to £90,000; and the price had been reduced from 3s. 9d. to 2s. 1d. per 1000 cubic feet.

COAL TRADE REPORTS.

Lancashire Coal Trade.

There has at last been a break in house coal prices. On Monday the colliery proprietors of Manchester and district raised the prices of all qualities of house coal 10d. per ton. This was only to be expected after the advance of 1s. per ton by the Yorkshire colliery owners, fixed to come into force on the same day. This reduction of 2d. below the Yorkshire prices will serve to strengthen the position of the Lancashire colliery proprietors. West Derbyshire also shares in the 1s. increase. The Lancashire coal trade for a long time past has been considerably handicapped by the competition in slack from the Yorkshire districts. The average quotations are: Best house coal 13s. 10d. to 14s. 10d., secondary 12s. to 13s., common 9s. 6d. to 10s. 6d., steam and forge 8s. to 9s., best engine fuel 7s. 6d. to 8s. 6d., best slack 6s. 9d. to 7s. 6d., medium 6s. to 7s., common 5s. to 6s. Shipping coal is 9s. 6d. to 10s. 6d. Furnace coke is 17s. to 24s. per ton.

Northern Coal Trade.

Though the coal trade is still quiet generally, the demand seems to show a slight increase, and there is a more decided forward inquiry. In steam coals, shipments are good, as the quantities for the Baltic must now be exported tolerably quickly. Best Northumbrian steams are from 10s. to 10s. 6d. per ton f.o.b., second-class steams are 9s. 6d., and steam smalls are from 6s. to 6s. 6d.—the demand being generally fair. As to gas coals, there is now a more decided increase in the consumption. Thus the deliveries on the long contracts are heavier, and take up a larger proportion of the production, more especially of best Durham gas coals, so that there is less for occasional sales. Prices vary a good deal—from about 9s. 6d. to 11s. per ton f.o.b., according to quality; but deliveries include heavy quantities that were sold months ago at lower prices. At the same time, for contracts that are now being negotiated, the quotations are near those that are included above—one such contract, for about 50,000 tons, for next year having been practically settled at a price that is near 10s. per ton f.o.b. for fair Durham coals; but there is always the doubt as to the allowance for freight, &c. In coke, the market is firm; and this has allowed gas coke to be quoted higher in some cases—good gas coke varying from 12s. to 12s. 9d. per ton f.o.b. in the Tyne.

Scotch Coal Trade.

There is a manifest slackness in the demand for coal, which is not expected to remove till the coal-tax is taken off. The anticipation is of brisker trade after that. Splint is at present in most demand. The prices quoted are: Main 8s. 9d. to 9s. per ton f.o.b. Glasgow, ell 8s. 9d. to 10s., and splint 9s. 6d. to 9s. 9d. The shipments for the week amounted to 281,595 tons—a decrease of 17,246 tons upon the preceding week, but an increase of 4029 tons upon the same week of last year. For the year to date, the total shipments have been 10,002,337 tons—an incease of 1,117,138 tons upon the corresponding period of 1905.

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The Opening of Roads in London.

The Works Committee of the Kensington Borough Council stated, in a report submitted last Tuesday, that they had considered a letter from the London County Council calling attention to the great inconvenience caused by the breaking up of streets in London by companies and others having statutory rights to do so, and mentioning that the Council were of opinion that great advantage would result if arrangements could be made for works to be carried out by the different authorities simultaneously at certain periods of the year. The County Council asked whether the Borough Council would be prepared to support them if they promoted legislation to make regulations to govern the opening of streets. The Borough Engineer, to whom the communication was referred, expressed the opinion that it would be undesirable that work done by statutory authorities in London should be carried out simultaneously, as many of the principal thoroughfares in the Metropolis would be annually barricaded at the same time. He further pointed out that if a certain period in the year were arbitrarily fixed during which any company or authority might open up streets, some saving clause would have to be inserted to provide for the opening of roads in cases of emergency, and it would be found in practice that fully 90 per cent. of the work would prove to be "emergency" work. He, however, suggested that useful legislation might be promoted to strengthen the hands of the Metropolitan Borough Councils in supervising and controlling the works carried out by statutory companies; provision being made by such legislation for the framing of regulations to deal with the following matters: (1) The position, depth, and direction of mains; (2) the maintenance of the surface at the expense of the company for a certain period after the roadway had been disturbed; and (3) the limitation of time during which intended works might be carried out after reasonable notice had been given by a Borough Council to a statutory company of such Council's intention to renew the surface of given streets. The Committee concurred in the views of the Engineer; and a communication embodying the substance of his report is to be addressed to the County Council.

The Outbreak of Enteric Fever at Fleetwood.—At a meeting of the Fleetwood Urban District Council last week, an interim report was received from a Committee specially appointed to investigate the causes of the outbreak of enteric fever among the officers in the camp, to which reference has already been made. It showed beyond the possibility of doubt that it was not connected with the water supply, the alleged removal of pipes during the night, the pollution or the condition of the water, or any of the causes which had been so freely discussed throughout the country. The opinion of the Water Examiners again affirmed that of the residents and visitors to the Fylde district, that the water supplied by the Water Board is absolutely pure, and that the presence of any bacteria associated with typhoid or other diseases is unknown. At the earliest possible date the Committee will complete their report and submit recommendations.

Coventry and a Gas Supply for Allesley.

The supply of gas to Allesley, situated about 1½ miles from Coventry, was a subject of further discussion at a meeting of the City Council last Tuesday. The Gas Committee reported that they had received a fresh application from Mr. W. J. Iliffe, in which he gave a guarantee against loss for seven years; but the Committee, after considering all the circumstances, decided not to entertain the application. Mr. Armishaw moved that the minute be referred back; arguing that if a supply of gas were provided for Allesley, it would lead to the development of Coventry on that side. He pointed out that up to the present the expansion of the city had taken place all in one direction; whereas this part had been left as it was. He considered that when they had a guarantee like the present one, the Committee ought not to refuse to grant the application. Mr. Bonsor said he knew that negotiations for the development of land in this neighbourhood were in progress; while Mr. Smith expressed the view that the Committee ought to look upon the application in a favourable light. Mr. Errington, a resident of Allesley, contended that the people themselves did not require the light, and that there was a suction-gas plant already provided by one of the residents, which had proved that, so far as small places were concerned, this was not a success. Alderman Andrewes advised the Committee and the Council not to place too much reliance on certain figures that had been given as to likely profits that would accrue if a gas supply were provided, and mentioned that the laying of 1½ miles of new mains would be involved. It transpired, in the course of the discussion, that the Committee's decision not to entertain the application was only carried by a majority of one. Mr. Batchelor, the Chairman of the Gas Committee, said that personally he was favourable to the application; and he thought that if a more definite offer were submitted, and the Committee could see that they were not likely to suffer any loss, they might reconsider it, though, judging by the views expressed, he did not think they would come to a different decision. Mr. Poole claimed that it was in the interests of the inhabitants of a town that they should spread themselves out more into the country districts; and on this ground he supported the granting of the application. By 24 votes to 18, the Council decided to refer the minute of the Committee back for further consideration.

Water Supply of Levenshulme.—The Manchester Water Committee consented to lay down a new main, in order to improve the Higher Levenshulme water supply, provided the Levenshulme Urban District Council would reduce the charge made for asphalt repairing from 3s. 3d. to 2s. 6d., and macadam or concrete from 1s. 6d. to 1s. The Council have agreed to accept the offer, but to reduce the charges in respect to this new main only; the reduction being made as a contribution towards the expense of laying the main. The reduction will not extend to any other work or department of the Corporation, owing to the fact that the Council are losing money by the concession.

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Gas-Works Purchase Question at Hull.

The Works Committee of the Hull Corporation have decided to recommend the Council to promote a Bill in the ensuing session of Parliament to enable them to purchase the undertaking of the Sutton, Southcoates, and Drypool Gas Company. Last session the Company obtained an Act conferring upon them further powers; and in this the Corporation obtained the insertion of a clause providing, among other things, that if the Corporation should introduce a Bill into Parliament next session to purchase the undertaking of the Company, nothing in the new Act should be deemed to prejudge or prejudice one way or the other the question of such purchase, and that the value of the undertaking should not be enhanced or depreciated by the passing of the Act, or by anything contained therein; but in addition to the value thereof, the Company should be repaid all moneys which an arbitrator, arbitrators, or umpire might deem to have been reasonably expended by the Company in obtaining the Act.

St. Helens Gas and Water Undertakings.

The Elective Auditors at St. Helens (Messrs. T. Dickenson and W. Holland), in their report on the borough accounts, remark that the gas concern keeps up its reputation as the backbone of the municipal undertakings. The profits for 1905-6 were £9660, as against £11,817 in 1904-5; thus showing a decrease on the year of £2157, the greater portion of which may be accounted for by the the fact that for nine months of the year the price of gas was 1d. per 1000 cubic feet less to the ordinary consumers and nearly 2d. to consumers by slot meters. During the past year, the amount paid in wages by the department was £13,650. Since the works have been taken over by the Corporation, the amount of profits which have been handed over to the borough fund amounts to £71,030. During this time the sum of £38,440 has been written off the works capital account, which leaves a much more valuable undertaking with a reduced burden of capital. In connection with the water accounts, the Auditors explain, no profit is allowed to be made from the supply of water. A reserve fund may be created of £20,000; but when this sum is attained, the charge for supply must be at or below cost price. The reserve fund last year was £8496; and at March 31 last, it had sunk down to £5470. This has caused the Water Committee to raise the prices for domestic and manufacturing supplies to an extent which is estimated to bring in a matter of over £1000 per annum more than the old charges. A large sum has been spent by the Water Committee in opposing the Southport, Birkdale, and West Lancashire Water Bill before the House of Commons, in which matter the St. Helens Corporation were defeated.

Torquay Gas Company.

Progress of a very satisfactory and substantial character continues to be made by the Torquay Gas Company. At the half-yearly meeting last Tuesday, Mr. W. B. Beynon, who presided, was able to congratulate the shareholders on an increase in the consumption of gas of over 6½ million cubic feet, compared with the corresponding period of 1905, and a consequent increase in the receipts from this source from £10,980 to £11,610. The balance in hand was stated by Mr. R. P. Kitson, the Secretary, to be £3496; and it was decided to pay the customary dividends of 10 and 7 per cent., and to carry forward a surplus of £136. Mr. C. N. Luxmore, referring to the competition of the municipal electricity undertaking, said the capital outlay of the Corporation on their works amounted to £49,000; and the profit was not quite 2½ per cent. What the position of the undertaking would have been if the Corporation had been allowed to pursue their policy unchecked, he did not know; but he thought it was to the benefit of the ratepayers that the opposition to an outlay of £42,000 on a new generating station was successful. The Gas Company, on the other hand, paid 10 and 7 per cent., and the accounts showed increased consumption and profits. Though the charge to ordinary consumers of electricity was 4·50d. per unit, he found that he paid nearly 7d. per unit. The price of 4·85d. per unit for public lighting should be reduced. In November, 1905, the Electric Construction Company made an offer to the Corporation which included a price of 2⅜d. per unit for public lighting for the first seven years, and a still lower sum for subsequent periods. Sympathy was expressed with the Chairman of the Company, Mr. J. Kitson, who was absent through ill-health. At the suggestion of a shareholder, the Directors promised to consider the question of providing a superannuation fund for the employees.

The New Storage Reservoir at Torquay.—It is reported that good progress is now being made with the construction of the new storage reservoir for the Torquay Corporation at Tottiford, on the borders of Dartmoor, and that the work will probably be completed by next spring. The undertaking has been one of some difficulty; and owing to the nature of the ground which forms the site of the embankment, the original estimate of the cost has been largely exceeded. In places the trench had to be excavated to a depth of 111 feet before a reliable foundation could be found; and as the excavation was mainly through granite, it was expensive work. The length of the trench is 710 feet; while the dam has a width of 300 feet at the base, and will be 22 feet wide at the top. The depth of water at the dam will be 50 feet; and the reservoir will have a holding capacity of 200 million gallons. This will bring up the total storage in the Torquay reservoirs to 500 million gallons, which is estimated to be sufficient to afford a constant and abundant supply for a population of 70,000. The present population of the district in the area of supply is about 52,000. It is some three years since the construction of the reservoir was begun. In the first place, a loan of £22,000 was asked for and obtained; a second application for a loan of £21,000 was subsequently made; and to-day there is to be another inquiry by the Local Government Board at which the Corporation will seek power to borrow £14,400, which is the estimate of the amount required to complete the work.

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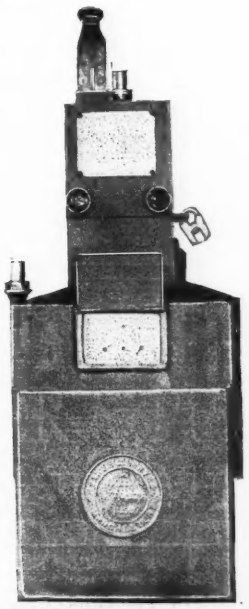

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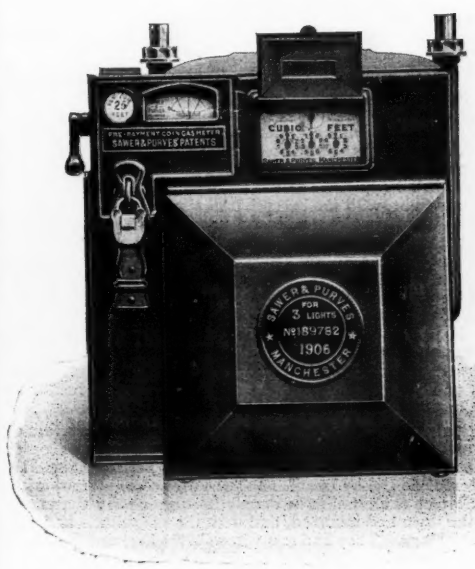

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Rochdale and the Gas Supply of Whitworth.—When the Rochdale Gas Committee met last Wednesday, a letter was read from the Whitworth Urban District Council inquiring whether the Corporation would be willing to supply their area with gas for street lighting and other purposes. Before coming to any decision or quoting any terms, the Committee resolved to ask the District Council whether they would be prepared to give a guarantee as to the quantity they would take.

High-Pressure Gas Lighting in Birmingham.—The installation of high-pressure gas lighting on Messrs. W. Sugg and Co.'s system which (as was notified in the "JOURNAL" for July 17, p. 202) the Birmingham Gas Committee decided on placing in Victoria Square, was put into operation last week; and the result was very satisfactory—the whole square, it is stated, "being lit with a brilliance which made the converging thoroughfares by contrast look very dim and gloomy." The high-pressure system has been applied to twelve triple-burner and eight single-burner lamps; the lighting power having been raised from 13,200 to 44,000 candles.

Result of a Typhoid Epidemic at Basingstoke.—Last April a case was heard at the Basingstoke County Court ("JOURNAL," Vol. XCIV., p. 184) in which a tradesman who was summoned by the Corporation for the recovery of his water-rate successfully pleaded non-liability owing to the fact that the water supplied was impure; and it was then stated that a large number of actions had been entered in the High Court of Justice against the Corporation in connection with a typhoid epidemic which was held to have arisen from the water supply. There were no less than fifty of these actions; and the damages claimed aggregated nearly £400,000. By arrangement, a Committee of the claimants met a Committee of the Ratepayers' Association, with the result that the Council have agreed to pay £1675 15s. in settlement of the whole of the actions, without prejudice, and with a denial of liability.

Scarcity of Water in North Wales.—In many of the great industrial centres of North Wales, considerable inconvenience is being caused through the continued drought, as during the past four months only a few insignificant showers of rain have fallen. Denbighshire appears to be the worst affected; the Dee being almost dried up. Last Sunday week, the Llangollen District Council's large reservoir there held only a few gallons of water; and the inlets were simply "spotting." The supply for the district is only sufficient for one-fiftieth of the residents. The collieries are seriously affected; and work at the Wynnstay pits had to be stopped for two or three nights owing to there being insufficient water to produce steam for driving the machinery. The climax was reached on Wednesday, when operations were entirely suspended, and about a thousand miners were thrown out of work. This is said to be the driest season for fifty years; and it is computed a week's continuous rain is required to bring matters to their normal condition.

Electric Light Not Appreciated at Wrexham.—An interesting discussion has taken place in the Wrexham Town Council with regard to a recommendation of the Electricity Committee that £315 should be spent on extending the cables so as to provide current for public and private purposes in certain parts of the town. Alderman Samuel observed that there were only 214 electric light users; and he asked if there were any means of increasing the number. To this the Chairman of the Committee (Mr. J. Stanford) replied that one practical way of doing this would be for all the members of the Council who had the opportunity to have their premises supplied with current. Such a shocking example was shown by some members of the Council in not taking advantage of the light, that it was no wonder outsiders did not do so. He agreed that the number of consumers was small; but it was increasing—slowly, but surely. Mr. Hughes moved that the matter be referred back; but after further discussion the amendment was withdrawn, and the extension was agreed to.

Gas v. Electricity at St. Austell.—Tenders for the lighting of the streets were laid before the St. Austell Urban District Council at their meeting on Tuesday last. The Electric Lighting Company offered to provide 250 14-candle power lights at a cost of 25s. each per annum, with an additional charge of £14 a year for switching on and off. The Company proposed that the lamps should be lit one hour after sundown, and extinguished in the outer district at 11.30 p.m. and in the inner district at midnight, with the exception of six of the lamps in the principal streets, which would remain on until one hour before sunrise. On moonlight nights, or when the contractors were instructed that the lights would not be needed, the lamps would not be lit. The Company offered to bear the entire cost of converting the present lamps to the purpose of electric lighting, and to make the conversion within 14 days from the signing of the contract where electric mains are already laid, and in 28 days in the outlying district. The Gas Company tendered for incandescent burners of 60-candle power at 35s. each, and three double burners at £1 each additional; the charge to include the cost of lighting and extinguishing. The Council referred the matter to the Lighting Committee.

Municipal Affairs at Shipley.—In moving a resolution that application be made to the West Riding County Council for an order increasing the membership of the Shipley Urban District Council from 15 to 20, Mr. Ellis Denby remarked that no one conversant with the affairs of Shipley could fail to be deeply impressed with the enormous liabilities the town had incurred, and with the magnitude and variety of its undertakings. They had many irons in the fire, and their finances did not exhibit the buoyancy and elasticity which was to be desired. The Gas and Electricity Department, the debt in respect of which stood at £330,000, was responsible for a large share of their indebtedness; and they might have hoped to see a margin of profit made. But last year the loss on gas was £1411, and on electricity £551; while the loss on the water-works was £713. It seemed to him that these municipal undertakings ought to be made to pay. He believed an increased membership would tend to a better oversight of details, with greater economy as the result. Mr. Hipkin, on the other hand, contended that if they regarded as dividends the payments in respect of sinking fund and interest, their undertakings were not losing money. The Chairman (Mr. J. Roberts), while favouring an increase in the number of members, said he believed the financial position of the town to be extraordinarily sound; and Mr. Denby replied that he had never really doubted this.

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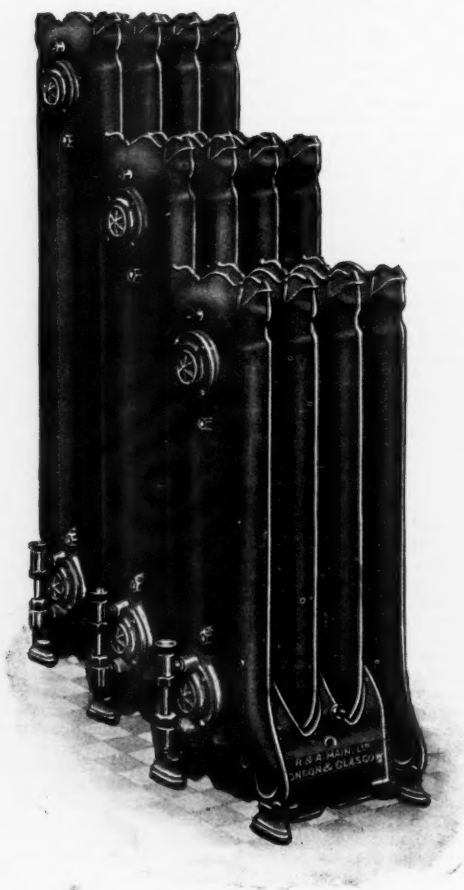

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The Typhoid Epidemic at Pontypool.—The epidemic of typhoid fever at Pontypool has already cost the Council £100; and it was stated at the recent meeting of the Council that they hoped to recover this sum from the Gas and Water Company. The Medical Officer of Health, in his report, said that 86 cases of typhoid had been notified, and there was no sign of abatement. He advised the use of the Pasteur filters. Many houses in the higher district had been days without water. It was resolved to ask the Company to disinfect the whole of the mains in the town.

Suffocation by Gas at Stockton.—An inquest was held on Friday on the body of Mr. Austin Walsh, a variety artist, who had died at a temperance hotel in the town. When his body was found, the gas was turned full on, and both the window and the door were shut. The latter had to be burst open. Evidence was given that Walsh was somewhat under the influence of drink when he retired to his bedroom, shortly after midnight; and the Coroner said he might have turned the gas out and inadvertently turned it on again, owing to his condition. A verdict of "Accidentally suffocated" was returned.

Suffocated by Gas at Southport.—"Accidental death" was the Jury's verdict at an inquest held at Southport on the body of James Wilson, a retired brick manufacturer, 87 years of age, who was found dead last Tuesday week. The deceased went to bed on Monday night in his usual health; and the following morning his daughter noticed a smell of gas as she was passing his bedroom door. On opening the door and going inside, she found her father lying unconscious on the bed, and the gas escaping from the bracket. Medical aid was summoned; but life was extinct. It was conjectured that deceased had turned off the gas, and then inadvertently turned it on again.

New Joint-Stock Companies.—The Bagnalstown Gas Company, Limited, has been registered with a capital of £3000, in £1 shares, to acquire and carry on the business of gas manufacturer of Mr. Robert Bruce Anderson, in Bagnalstown, Co. Carlow, under style of the Bagnalstown Gas Company, and all or any of the assets of the proprietors. Among the first Directors are Mr. Thomas B. Younger, Assoc. M.Inst.C.E., and Mr. Robert Bruce Anderson, Assoc.M.Inst.C.E. Under the title of Anderson and Duffield, Limited, a Company has been registered with a capital of £25,000, in £1 shares, of which 11,000 are preference, to acquire and amalgamate the business carried on by Messrs. Anderson and Co., Limited, of Farringdon Road, E.C., and Messrs. Mark Duffield and Sons, Limited, of Slough. There will be no initial public issue.

Bexhill Water and Gas Company.—An ordinary general meeting of this Company was held last Thursday at the Cannon Street Hotel, E.C. Mr. A. H. Kersey, who presided, in moving the adoption of the report, said the receipts for the six months ended June 30, compared with those of the corresponding period of last year, showed an increase of £472. The exceptional circumstances connected with the establishment of the new works had involved rather a heavy expenditure in many directions; but the outlay had been necessary in order to maintain the high standard of efficiency which they had set before them. The Company had made good progress; and the dividend the Directors recommended was fully justified. An extraordinary meeting was subsequently held, when a resolution was passed authorizing the Directors to create and issue debenture stock bearing interest at the rate of 4 per cent. per annum.

Gas Suffocation Case at Scarborough.—An inquiry was held last week into the circumstances attending the death of Mr. John Robson, aged 75, a retired draper of Houghton-le-Spring. Deceased had been an annual visitor at Scarborough for a quarter-of-a-century; and this year he stayed at the Belle Vue Hotel. As he did not come down to breakfast on the 6th ult., the landlord went to his room and called, but could get no response. The landlord then climbed through a bedroom window, and found Mr. Robson on his bed unconscious. The room was full of gas, and the tap was turned on full. The maid said she left the gas lighted, and it would be alight when Mr. Robson went to bed. Dr. Handcock said he found deceased suffering from coal-gas poisoning. Septic pneumonia supervened; and that was the cause of death. When deceased was asked how he came to be in the condition in which he was found, he said he could not recollect. The Jury returned a verdict of "Accidental death."

The Coventry City Council have appointed a Special Committee to prepare and submit a scheme for superannuation for all officials and workmen in their employ. This decision was arrived at unanimously.

The Tynemouth Corporation are improving the lighting of their district by re-arranging and adding to the number of lamps, and also by adopting incandescent gas-burners in place of the flat-flame ones hitherto in use.

The Directors of the Consolidated Water-Works Company of Rosario, Limited, have declared an interim dividend on the ordinary shares at the rate of 6 per cent. per annum, tax free, for the half year ended the 30th of June.

The report of the Antwerp Water-Works Company for the six months ended June 30 shows a net profit of £24,048, as compared with £22,520 for the same period of 1905. The Directors have declared an interim dividend for the half year at the rate of 8 per cent. per annum.

During the early portion of the evening service at Christ Church, Tettenhall Wood, near Wolverhampton, last Sunday week, the electric light failed, leaving the place in total darkness. The congregation left the church by the aid of a few lamps which were brought in from neighbouring houses.

Owing to the stock of water in the Lyme reservoir having fallen seriously, the Stockport Water Committee have given notice to discontinue the supply between the hours of 7 p.m. and 7 a.m., and consumers have been warned to exercise economy. At Alfreton, also, the Urban District Council, who some time since cut off the supply of water for trade purposes, have now found it necessary to restrict the domestic supply to certain hours of the day.

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It is stated that since the installation of the Kitson lighting system at Ostend Quay, the trans-Channel boats arriving at night are enabled to land passengers without the aid of their searchlights. According to a paragraph in the Engineering Supplement to "The Times," the Kitson Light Foreign Supply Company, Limited, are about to erect works in Belgium.

At the monthly meeting of the Gelligaer Rural District Council, terms for the supply of gas for public lighting in Bargoed were submitted by Mr. E. M. Hann, on behalf of the Powell Duffryn Company—viz., 2s. per 1000 cubic feet; the Company to carry the mains to the nearest point where the Council possess a street-lamp. It was decided to accept the terms of the Company for the supply of gas in Bargoed streets not already lighted, and to consider their offer for the whole of the street-lamps later on.

The Richmond Gas Stove and Meter Company, Limited, held on Friday, the 21st ult., at their Chelsea Meter-Works (Messrs. George Glover and Co.), the half-yearly conference of their representatives. Mr. H. M. Thornton, the Vice-Chairman and Managing-Director, presided. In the evening, the representatives were entertained at dinner by the Directors of the Company.

As will be seen from our advertisement columns to-day, the Croydon Gas Company invite tenders for £20,000 of "D" stock; the minimum price for which has been fixed at £107 per £100 of stock. Holders of the stock are entitled to a fixed maximum dividend of 5 per cent.; and up to this rate the stock ranks *pari passu* with the "B" stock, the last dividend on which was at the rate of 11½ per cent. per annum. Tenders are to be delivered at the Company's offices not later than Wednesday, the 17th inst.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

DRAUGHTSMAN. No. 4654.
FOREMAN FITTER. No. 4657.
SUPERINTENDENT (Workshops and Out Door). Glasgow Gas Department. Applications by Oct. 15.
CHARGE OF SHOW-ROOM. Ilford Gas Company.
INSPECTOR OF METERS, &c. No. 4660.
FITTERS. No. 4659.

Pupil Required.

No. 4658.

As Representative in Australia. W. G. Quicke, Perth, W. A.

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MANAGER (Gas or Gas and Water). No. 4656.
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STEAM NAVVY. Sheffield Water Department.

Plant, &c., Wanted.

EXPERIMENTAL GASHOLDERS. No. 4653.

Stocks and Shares.

ALDERSHOT GAS AND WATER COMPANY. Oct. 16.
CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY. Oct. 16.
CROYDON GAS COMPANY. Oct. 17
DENBIGH WATER COMPANY. Nov. 1.
LOWESTOFT WATER AND GAS COMPANY. Oct. 16.
NORTHFLEET AND GREENHITHE GAS COMPANY. Oct. 16.
REDDITCH GAS COMPANY. Oct. 25.
SOUTHEND WATER COMPANY. Oct. 16.

TENDERS FOR

Conveying Machinery and Coal Breaker.

COVENTRY GAS DEPARTMENT. Tenders by Oct. 15.

Fire-Clay Goods.

ROCHESTER, CHATHAM, AND STROOD GAS COMPANY. Tenders by Oct. 8.

Hydraulic Plant — Tipping Machines, Lift, Capstan, &c.

COVENTRY GAS DEPARTMENT. Tenders by Oct. 15.

Oxide of Iron.

SALFORD GAS DEPARTMENT. Tenders by Oct. 11.

Pipes, &c.

STOCKPORT GAS DEPARTMENT. Tenders by Oct. 10.

Steam Engines, &c.

COVENTRY GAS DEPARTMENT. Tenders by Oct. 15.

Tar and Liquor.

CHIGWELL, LOUGHTON, AND WOODFORD GAS COMPANY. Tenders by Oct. 16.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under, 3s.; each additional Line, 6d.

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